Project Notes:

Project Title: Air Pollution Running Mask

Name: Ayaan Hegde

Note Well: There are NO SHORT-cuts to reading journal articles and taking notes from them. Comprehension is paramount. You will most likely need to read it several times, so set aside enough time in your schedule.

Knowledge Gaps:

This list provides a brief overview of the major knowledge gaps for this project, how they were resolved and where to find the information.

Knowledge Gap	Resolved By	Information is located	Date resolved
Types of air pollutants affecting my area	I researched Massachusetts government websites to get this data	https://www.mass.gov/info-details/criteria-air-pollutants	10/01/24
Finding a comfortable material for a mask	Researching through journal articles	Journal Article 9	9/22/24
How does electrospinning work?	Researching through journal article	Journal Article 9	9/25/24
What is the effect of microplastics on running performance	Researching through journal articles	Journal Article 10	10/08/24
How prosthetic fingers are made and used	Researching through journal articles	Journal Article 2	9/15/24
What health effects do you get from inhaling too much air pollution.	I searched on the World Health Organization website	https://www.who.int/teams/environment-climate-change-and-health/air-quality-energy-and-health/health-impacts#:~:text=Air%20pollution%20is%20a%20risk,(household%20air%20pollution%20only).	10/2/24
How should I start the engineering process?	Working in STEM class using fishbone diagrams and tables (Whale Problem)	Mass Academy	9/30/24
Where can I access an electro spinner?	Researching through places, found one at WPI	WPI Website	10/2/24

Who can I ask for mentorship?	Researched through WPI Website and trying to find professors that are experts in this field	WPI Website	10/2/24
What is a good test to determine the amount of pollutants that cross my filter?	Research through journal articles	Journal Article 14	10/23/24
What is a good way to determine how well my mask works in real-world applications?	Research through journal articles	Journal Article 4	10/24/24
What should the design of my mask look like?	Research through journal articles	Journal Article 13	10/19/24
What would my replacement be for the light transmittance test?	Researched PM2.5 detectors through many websites	https://www.vernier.com/product/davis-instruments-airlink-air-quality-monitor/	10/29/24
Which polymer do I want to use for electrospinning?	Researched articles on which polymer to use	Journal Article 15	11/10/24
What is some other alternative mask designs I could use	Researched through journal articles	Journal Article 18	12/09/24
Should I focus more on running or jogging?	Researched through journal articles	Journal Article 19	12/15/24

Literature Search Parameters:

These searches were performed between (Start Date of reading) and XX/XX/2019.
List of keywords and databases used during this project.

Database/search engine	Keywords	Summary of search
Science Direct	Air Pollution	Air Pollutions affect on Tourism, Atmosphere, and how we can limit them
Nature Communications	Air Pollution	Shows how air pollution is rising due to industrial enhancements
PLoS One	Prosthetic Fingers	Shows how different prosthetic fingers were made for different uses
Scientific Reports	Air Pollution Running	Shows the impacts of a runner when exposed to air pollutants
Journal of Membrane Science	Electrospinning	Shows how the process of electrospinning works and what the benefits of using a nano-fiber material is
Water Research	Microplastics	Shows the sources of microplastics, their effects, their growth, and their potential outlook in the future
Science Direct	Running Performances	Shows what things effect running performances and what can be done to increase them
Science Direct	Face Masks	Shows what different face masks are there and their benefits and downsides in certain situations. It also includes the impact of them in different environments
Science Direct	Microplastics	Shows the effects of microplastics on the

		environment and on human health.
Science	Microplastics Effect	Shows the effect of microplastics on human health
Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology	Microplastics and Masks	Shows how much microplastic particles are emitted from disposable surgical masks
Photonic Instrumentation Engineering	Light Transmittance	Shows and teaches how determine how many pollutants cross a certain area
RSC Advances	Nylon 6/6	Shows how to electrospin a Nylon 6/6 polymer and the benefits of it towards designing a mask
The Journal Emergency Medicine	Bag-Valve Mask	Shows the techniques and benefits of using a bag-valve mask in an entirely different scenario

Tags:

Tag Name	
#Air Pollution	#Electrospinning
#Running	#MarathonRunnerPollution
#Microplastics	#ChinaAir
#Nylon6/6Electrospinning	#JoggingPM2.5
#MaskDesign	#Bag-Valve Mask
#LightTransmittance	#ElectrospinningForViruses

Article #1 Notes: Title

Article notes should be on separate sheets

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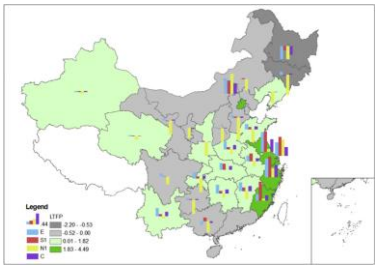
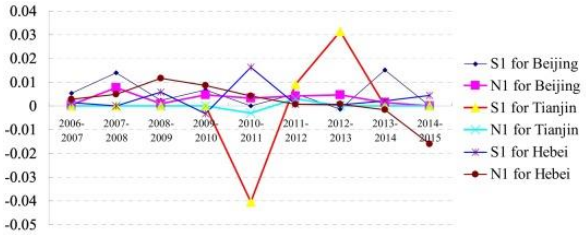
Source Title	
Source citation (APA Format)	
Original URL	
Source type	
Keywords	
#Tags	
Summary of key points + notes (include methodology)	
Research Question/Problem/ Need	
Important Figures	
VOCAB: (w/definition)	
Cited references to follow up on	
Follow up Questions	

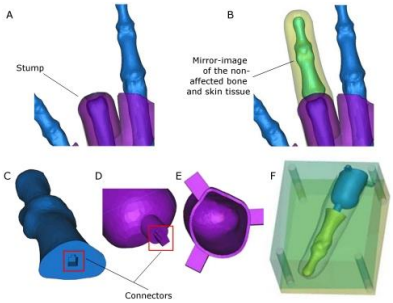
Article #1 Notes: Energy Use, Industrial Soot and Vehicle Exhaust Pollution – China's Regional Air Pollution Recognition, Performance Decomposition and Governance.

Article notes should be on separate sheets

Source Title	Energy Economics
Source citation (APA Format)	Miao, Z., Baležentis, T., Shao, S., & Chang, D. (2019). Energy use, industrial soot and vehicle exhaust pollution—China's regional air pollution recognition, performance decomposition and governance. *Energy Economics*, *83*, 501–514. https://doi.org/10.1016/j.eneco.2019.07.002
Original URL	https://www-sciencedirect-com.ezpv7-web-p-u01.wpi.edu/science/article/pii/S0140988319302142
Source type	Journal Article
Keywords	Atmospheric Pollution, "In order to identify", "We propose", Total Factor Productivity, Slack-based decomposition
#Tags	#ChinaAirPollution
Summary of key points + notes (include methodology)	This article talks about the concerns of China's air quality. The authors calculated China's regional pollution levels to figure out what the main pollutants are. The two driving forces for pollution are SO_2 and NO_x, which derives from vehicular emissions and other industrial processes. The methodology included considering the rates of pollution alongside the measures of TFP (Total Factor Productivity) for the pollutant emission density. The slack-based DEA (Data Envelopment Analysis) will result in tracing the trends in the environmental performances. In addition, they also applied the DDF (Directional Distance Function), which provided a framework that included economic activities and pollutant emissions. This allows for the construction of environmentally sensitive and efficiency and productivity change indicators.
Research Question/Problem/ Need	How should the government set provisions and regulations to limit the

	excess SO_2 and NO_x in the regional Chinese areas?
Important Figures	 Atmospheric environmental total factor productivity (AETFP) levels in different regions of China based on SO_2 and NO  The levels of SO_2 and NO in Bejing, Tianjin, and Hebei
VOCAB: (w/definition)	Haze – A slight obscuration of the lower atmosphere Urbanization – The process of making an area more urban, more populated Total Factor Productivity: How much output can be produced from a certain amount of inputs
Cited references to follow up on	Abad, A. (2015). An environmental generalised Luenberger-Hicks-Moorsteen productivity indicator and an environmental generalised Hicks-Moorsteen productivity index. *Journal of Environmental Management*, *161*, 325-334. Chung, Y. H., Färe, R., & Grosskopf, S. (1997). Productivity and undesirable outputs: a directional distance function approach. *journal of Environmental Management*, *51*(3), 229-240.
Follow up Questions	What materials can be used to limit air pollutants from entering the lungs? What are other causes of air pollution besides vehicular exhaust? How can I make masks a comfortable experience for avid runners?

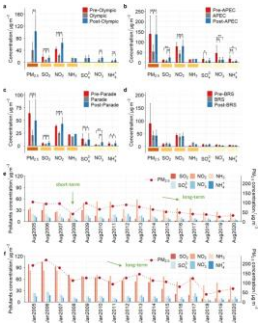
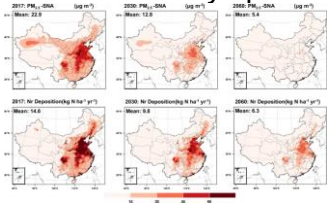
Article #2 Notes: Patient-Specific Prosthetic Fingers by Remote Collaboration – A Case Study

Source Title	PLoS One
Source citation (APA Format)	Cabibihan, J.-J. (2011). Patient-specific prosthetic fingers by remote collaboration–A case study. *PLoS ONE*, *6*(5). https://doi.org/10.1371/journal.pone.0019508
Original URL	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3087799/
Source type	Journal Article
Keywords	Amputation, Prosthetic, Prosthesis,
#Tags	#FingerProsthetic
Summary of key points + notes (include methodology)	The use of prosthetics can help the patient suffering from grief, pain, and depression. Through collaboration, the prosthetics will be made using visualization, computerized design, and various tools. The prosthetic will be used to help ease the mental state of the patient and will try to accomplish to help them feel like themselves before the accident. This method is accomplished by making a mold of the patient's stump, and then silicon rubber will be poured and cooled. One of the patients they received was a 48-year-old woman who lost her ring finger in a laundry spinner accident. She is embarrassed whenever she goes out in public, so she requested a prosthetic finger. To design the prosthetic, they needed CT scans from the patient. They conducted a mirror operation of the finger from the CT scans to create a replica of the finger. The geometries of the skin tissue and bone was included in this mirroring process. After this model was completed, they converted it to STL files and sent it to a rapid prototyping machine , an Eden 3D printer.
Research Question/Problem/ Need	What are some other ways patients can receive a prosthetic efficiently?
Important Figures	 The image above describes the design of the prosthetic finger. This explicitly shows the female connector of the prosthetic properly connected with the stump of the finger.

VOCAB: (w/definition)	Computer Tomography – X-rays that produces images inside of the body Stereolithography – Manufacturing process that uses lasers
Cited references to follow up on	Parkes CM. Psycho-social transitions: Comparison between reactions to loss of a limb and loss of a spouse. *British Journal of Psychiatry.* 1975;127:204–210. Desmond D, MacLachlan M. Psychosocial issues in the field of prosthetics and orthotics. *Prosthetics and Orthotics.* 2002;14:19–22.
Follow up Questions	How can I make a prosthetic that adds to the 5 fingers already there? Is it possible to feel the 6th finger prosthetic? How can I make it comfortable, like as it never left?

Article #3 Notes: Combined Short-Term and Long-Term Emission Controls Improve Air Quality Sustainability in China

Source Title	Nature Communications
Source citation (APA Format)	Wen, Z., Ma, X., Xu, W., Si, R., Liu, L., Ma, M., Zhao, Y., Tang, A., Zhang, Y., Wang, K., Zhang, Y., Shen, J., Zhang, L., Zhao, Y., Zhang, F., Goulding, K., & Liu, X. (2024). Combined short-term and long-term emission controls improve air quality sustainably in China. *Nature Communications*, *15*(1). https://doi.org/10.1038/s41467-024-49539-9
Original URL	https://www.nature.com/articles/s41467-024-49539-9#citeas
Source type	Journal Article
Keywords	Air Pollution, Atmospheric Disposition, Climate Change
#Tags	#PreventPollution
Summary of key points + notes (include methodology)	With the growth of China's economy, more and more industrial emissions have been produced and polluted the Chinese atmosphere. In response, the

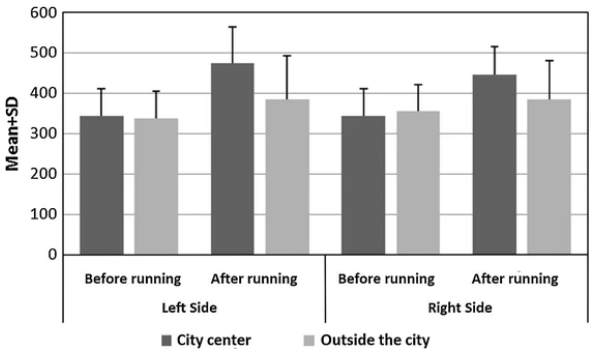
	Chinese government has initiated the “Blue Skies” initiative and reduced all national activities that produce sulfur dioxide and nitrogen oxide in the environment. With this, PM 2.5 levels reduced and the soot in the water droplets dissipated. Some methods this article undertook were taking in PM levels in the atmosphere and analyzing those samples to obtain approximate calculations of pollution levels.
Research Question/Problem/ Need	How can we implement effective short-term emission reduction measures to prevent further air pollution?
Important Figures	 These tables show the different types of chemicals in the air before and after the Olympics  Average PM levels and Nitrogen deposition in 2017, 2030, and 2060
VOCAB: (w/definition)	PM – Particulate Matter, which is a type of an air pollution that consists of fine droplets Volatilization – Changing a liquid to a gas Deposition – Letting something fall
Cited references to follow up on	Liu, J. & Diamond, J. China’s environment in a globalizing world. *Nature* **435**, 1179–1186 (2005). Larssen, T. et al. Acid rain in China. *Environ. Sci. Technol.* **40**, 418–425 (2006).
Follow up Questions	What level of PM is dangerous? To follow up, what level will it make it so that it is incapable of breathing? PM levels in Massachusetts?

Article #4 Notes: Running With a Mask? The Effect of Air Pollution on Marathon Runners' Performance

Source Title	Journal of Sports Economics
Source citation (APA Format)	Guo, M., & Fu, S. (2019). Running With a Mask? The Effect of Air Pollution on Marathon Runners' Performance. Journal of Sports Economics, 20(7), 903-928. https://doi.org/10.1177/1527002518822701
Original URL	https://journals-sagepub-com.ezpv7-web-p-u01.wpi.edu/doi/full/10.1177/1527002518822701
Source type	Journal Article
Keywords	Air Pollution, Particulate Matter, Respiratory, Short-run productivity
#Tags	#Marathon Runner Pollution
Summary of key points + notes (include methodology)	In this article, the authors took the statistics of marathon runners in China and calculated their running time while enduring harsh conditions from air pollution. to figure out if air pollution affected a runner's performance. They did this by taking runners' performances in cities in China and separating data in less air-polluted areas and densely air-polluted areas. They also considered many variables like wind speed, humidity, temperature, and precipitation. Thus, they figured out that runners in less air pollution areas had a faster average time than those in densely polluted areas, proving air pollution affects runners. Proving this also shows that many runners quit city-wide competitions because of the harsh conditions.
Research Question/Problem/ Need	What can the government do to suppress air pollution, so it doesn't hinder runner's performance?
Important Figures	 Chinese cities with marathons
VOCAB: (w/definition)	Air Pollution Elasticity: Relationship between population density and air pollution AQI: Air Quality Index (100-500) (The higher the number, the worse air

	quality)
Cited references to follow up on	Adhvaryu A., Kala N., Nyshadham A. (2014). *Management and shocks to worker productivity: Evidence from air pollution exposure in an Indian garment factory* (Working Paper). Ann Arbor, MI: University of Michigan. Allen E., Dechow P., Pope D., Wu W. (2017). Reference-dependent preferences: Evidence from marathon runners. *Management Science*, 63, 1657–1672.
Follow up Questions	Will the runner be able to run long distances? How can I make sure their pace is not hindered? Any way to boost their pace?

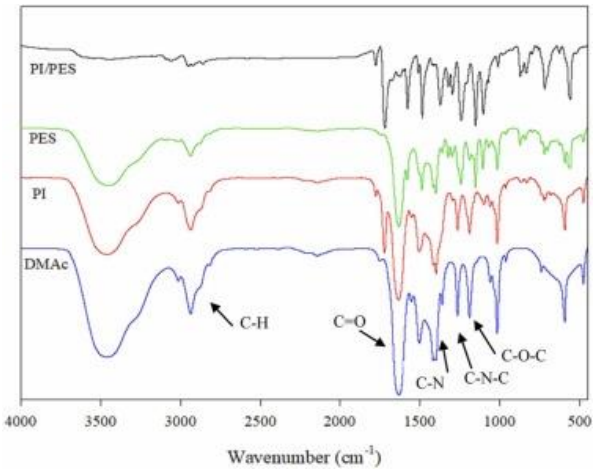
Article #5 Notes: The Effects of Air Pollutants on Nasal Functions of Outdoor Runners

Source Title	European Archives of Oto-Rhino-Laryngology
Source citation (APA Format)	Aydın, S., Cingi, C., San, T., Ulusoy, S., & Orhan, İ. (2013). The effects of air pollutants on nasal functions of outdoor runners. *European Archives of Oto-Rhino-Laryngology*, *271*(4), 713–717. https://doi.org/10.1007/s00405-013-2610-1
Original URL	https://link-springer-com.ezpv7-web-p-u01.wpi.edu/article/10.1007/s00405-013-2610-1
Source type	Journal Article
Keywords	Nasal Functions, Respiratory Resistance, Nasal Air Flow
#Tags	#Nasal Functions
Summary of key points + notes (include methodology)	Air pollution in city centers is increasing due to diesel exhaust from vehicles. The diesel particles can pass through the nose without filtration, helping them go deeper into the lungs. Even worse, with the higher air flow during exercise, especially running, the pollution particles will travel even deeper into the lungs During running, your nasal resistance will lower, and that will allow air pollution particles from the vehicles to enter the lungs much more easily. 20 adult runners were tasked with running for 60 minutes in a traffic-heavy area. They then ran the same amount of time in an area with less traffic. Nasal transport time and resistance were tested and compared for both tests
Research Question/Problem/ Need	Does running in or outside the city affect the nasal resistance and nasal transport times of outdoor runners?
Important Figures	 Distribution of inspiration measurements

VOCAB: (w/definition)	Rhinomanometry: measures airflow and pressure in the nose Sympathetic System: nerves that prepare the body for mental and physical activity Mucociliary Clearance: A self-cleaning mechanism that removes mucus and foreign particles in the respiratory system
Cited references to follow up on	Fonseca MT, Voegels RL, Pinto KM (2006) Evaluation of nasal volume by acoustic rhinometry before and after physical exercise. Am J Rhinol 20(3):269–273 Bussières M, Pérusse L, Leclerc JE (2000) Effect of regular physical exercise on resting nasal resistance. J Otolaryngol 29(5):265–269
Follow up Questions	What other body systems get affected by air pollution? Does the type of air pollution matter with entering the nasal functions? What are sicknesses you can obtain when inhaling pollution?

Article #6 Notes: Biocompatible Nanofiber Based Membranes for High-Efficiency Filtration of Nano-Aerosols with Low Air Resistance

Source Title	Process Safety and Environmental Protection
Source citation (APA Format)	Chen, H.-W., Kuo, Y.-L., Chen, C.-H., Chiou, C.-S., Chen, W.-T., & Lai, Y.-H. (2022). Biocompatibile nanofiber based membranes for high-efficiency filtration of nano-aerosols with low air resistance. *Process Safety and Environmental Protection*, *167*, 695–707. https://doi.org/10.1016/j.psep.2022.09.052
Original URL	https://www-sciencedirect-com.ezpv7-web-p-u01.wpi.edu/science/article/pii/S0957582022008254
Source type	Journal Article
Keywords	Electrospinning method, Polyimide, Polyether sulfone
#Tags	#Nanofiber

Summary of key points + notes (include methodology)	In this article, it discusses how particulate matter and bacteria, like the coronavirus, are increasing. Instead of using the inefficient surgical mask, it talks about another way to increase air filtration. They discuss the use of nanofibers and electrospinning them. Because it creates such small nanofibers, it can filter out nanoparticles in the atmosphere. They got polyimide (PI) and polyether sulfone (PES) and dissolved it in dimethylacetamide and ran an electric current through it. They get nanofiber material out of this; this process is called electrospinning. The article strived to obtain the most optimal ratio of PI to PES., the best one being a 50:50 ratio. This mask had a 99.74% filtration rate.
Research Question/Problem/ Need	Will electrospinning nanofibers create an efficient mask to protect against the rising pollutants?
Important Figures	 FTIR spectrum of PI/PES nanofibrous membrane
VOCAB: (w/definition)	Electrospinning: A method that uses electric force to draw charged threads of polymer for producing nanofibers Taguchi Method: Statistical methods to improve quality of manufactured goods
Cited references to follow up on	Anandjiwala, R. D., & Boguslavsky, L. (2008). Development of needle-punched nonwoven fabrics from flax fibers for air filtration applications. *Textile Research Journal*, *78*(7), 614-624.
Follow up Questions	Is there any other methods to create an effective mask? How expensive is the electrospinning process? Will I need additional materials to make one for runners?

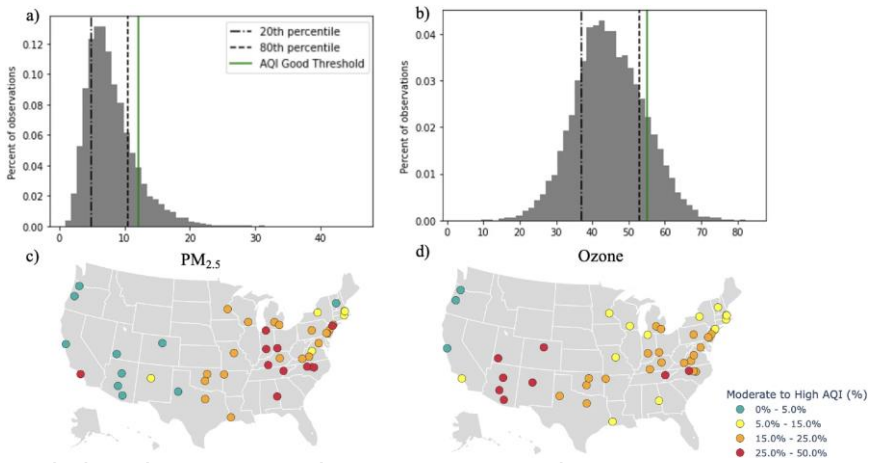
Article #7 Notes: The Health Effects of Exercising in Air Pollution

Source Title	Sports Medicine
Source citation (APA Format)	Giles, L. V., & Koehle, M. S. (2013). The health effects of exercising in air pollution. *Sports Medicine*, *44*(2), 223–249. https://doi.org/10.1007/s40279-013-0108-z
Original URL	https://www.proquest.com/docview/1624971864?accountid=29120&parentSessionId=8pKts96yhm6Nd3sjBlEChC1jXveunn%2FSO00gek%2BBW9A%3D&pq-origsite=primo&sourcetype=Scholarly%20Journals
Source type	Journal Article
Keywords	Cardiovascular, Urban Air Pollution, Oxidative Stress
#Tags	#Health Effects
Summary of key points + notes (include methodology)	This article discusses the effects on overall health while exercising in a densely polluted area. It first lists a lot of pollutants that are in the current atmosphere like, particulate matter, ground-level ozone, and carbon monoxide. It explains how exercise can make people vulnerable to diseases because of the increased breathing. The minute ventilation (VE) increases with exercise, and bigger pollutants can enter the body. The many pollutants that enter the body can cause inflammation of the lungs, or sometimes even death.
Research Question/Problem/ Need	What are the health effects of when you are exercising in a polluted area?
Important Figures	No figures in the article
VOCAB: (w/definition)	Minute Ventilation: The amount of air that enters the body in one minute Cardiovascular: The body system that includes the heart, arteries, and veins
Cited references to follow up on	1. Blair SN. Physical inactivity: the biggest public health problem of the 21st century. Br J Sports Med. 2009;43(1):1-2.

	2. Williams PT. Reduction in incident stroke risk with vigorous physical activity: evidence from 7.7-year follow-up of the national runners' health study. Stroke. 2009;40(5):1921-3. doi:10.1161/STROKEAHA.108.535427.
Follow up Questions	What precautions can runners take in order to reduce pollutants entering the body? Is there something beside a mask that can do this? How can runners know if they are in serious danger of pollutant-related diseases

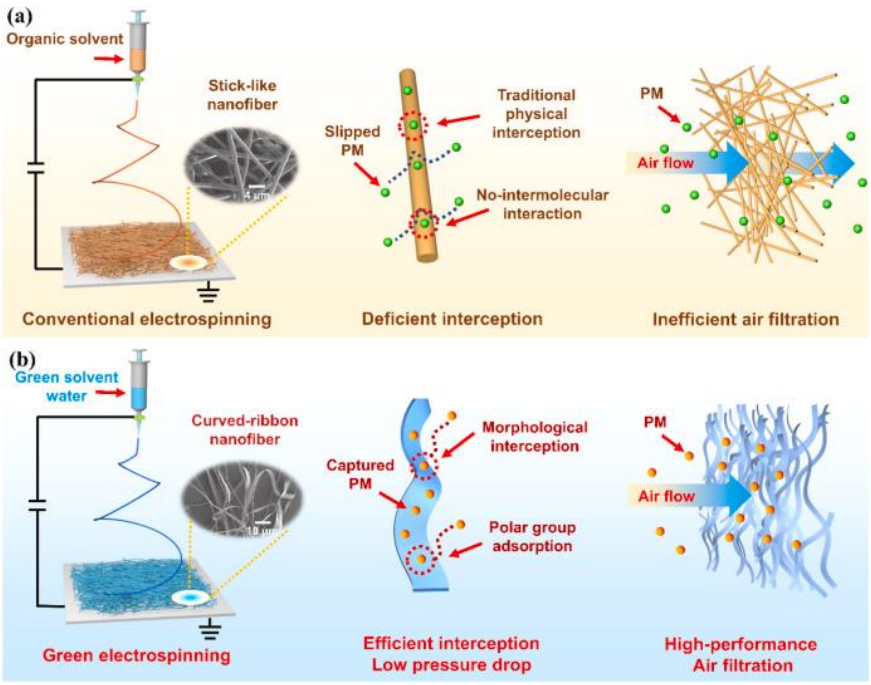
Article #8 Notes: Impact of Air Pollution on Running Performance

Source Title	Scientific Reports
Source citation (APA Format)	Cusick, M., Rowland, S. T., & DeFelice, N. (2023). Impact of air pollution on running performance. *Scientific Reports*, *13*(1), 1-9. https://doi.org/10.1038/s41598-023-28802-x
Original URL	https://www.nature.com/articles/s41598-023-28802-x#citeas
Source type	Journal Article
Keywords	Pulmonary Tidal Volume, Air Quality Index
#Tags	#PollutionOnRunning
Summary of key points + notes (include methodology)	High pollution originating from frequent wildfires and industrial exhaust have a constant effect on sporting events, where they are constantly canceled due to hazardous conditions. The methodology was having NCAA-caliber track students race a 5k and observing their performance while exposed to pollution. The respiratory system will be observed while the racing is occurring. The results were that those athletes would have a slower 5k time when in pollution compared to when they are not in pollution
Research Question/Problem	What is the impact of repeated exposure to pollutants when athletes are racing?

/ Need	
Important Figures	 Variations in PM 2.5 and ozone concentrations
VOCAB: (w/definition)	Pulmonary Tidal Volume: The amount of air entering and leaving your body with each breath Distributed-Lag Non-linear models: A statistical method to estimate an exposure-time-response function
Cited references to follow up on	Popke, M. California Wildfires Continue to Impact Sports Events. https://www.sportsdestinations.com/destinations/california/california-wildfires-continue-impact-sports-events-13648 (2017). Albeck-Ripka, L., Fuller, T. & Healy, J. The Dixie Fire is spreading noxious smoke more than 1,000 miles away. https://www.nytimes.com/2021/08/10/us/the-dixie-fire-is-spreading-noxious-smoke-more-than-1000-miles-away.html (The New York Times, 2021).
Follow up Questions	Does the participant's run level matter when testing? What is the best participant to test on for running? What kind of tests do I need to take?

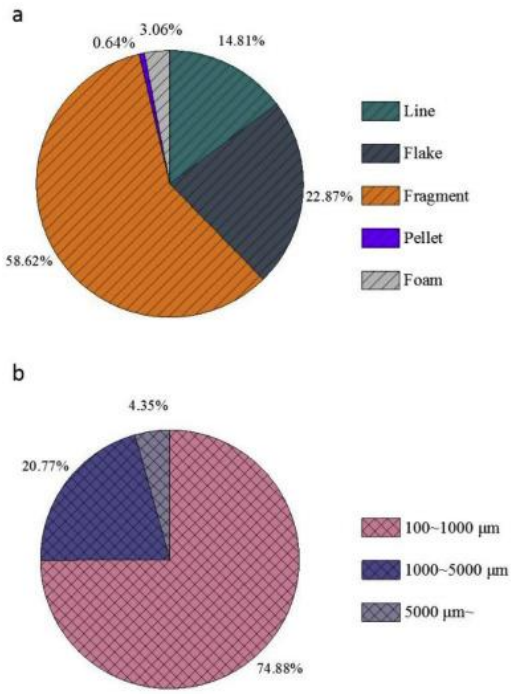
Article #9 Notes: Multi-hierarchical Nanofiber Membrane with Typical Curved-Ribbon Structure Fabricated by Green Electrospinning for Efficient, Breathable and Sustainable Air Filtration

Source Title	Journal of Membrane Science
Source citation (APA Format)	Deng, Y., Lu, T., Zhang, X., Zeng, Z., Tao, R., Qu, Q., Zhang, Y., Zhu, M., Xiong, R., & Huang, C. (2022). Multi-hierarchical nanofiber membrane with typical curved-ribbon structure fabricated by green electrospinning for efficient, breathable and Sustainable Air Filtration. *Journal of Membrane Science*, *660*, 120857. https://doi.org/10.1016/j.memsci.2022.120857
Original URL	https://www-sciencedirect-com.ezpv7-web-p-u01.wpi.edu/science/article/pii/S0376738822006020
Source type	Article Journal
Keywords	Electro-spinning fiber membrane, Curved-ribbon fiber
#Tags	#ElectrospinningPt2
Summary of key points + notes (include methodology)	With rising air pollution, fiber filter production is becoming more attractive due to its air permeability, flexibility, and convenient production. More specifically, nanofibers are more in use to combat even the smallest of particles. The fabrication of nanofibers consists of electrospinning, phase separation, plasma induction, template synthesis, and more. To efficiently capture the most PM, it was found that a ribbon-like structure was better than straight-lined one. The electrospinning process requires a lot of organic material, rather than using industrial processes like polypropylene. Using water solvents could filter out more PM.
Research Question/Problem/ Need	How can we create a more environmental friendly mask?

Important Figures	 Use of organic solvents vs. green water solvents
VOCAB: (w/definition)	Air permeability: The measure of how easily air passes through a material Porosity: The holes liquids and air may pass through
Cited references to follow up on	I.C. Dedoussi, S.D. Eastham, E. Monier, S.R.H. Barrett Premature mortality related to United States cross-state air pollution Nature, 578 (2020), pp. 261-265 A. Jbaily, X. Zhou, J. Liu, T.H. Lee, L. Kamareddine, S. Verguet, F. Dominici Air pollution exposure disparities across US population and income groups Nature, 601 (2022), pp. 228-233
Follow up Questions	Is it better to make the mask more eco-friendly? If so, does it seem it would take more resources? Where can I obtain these resources?

Article #10 Notes: Municipal solid waste (MSW) Landfill: A source of microplastics? - Evidence of microplastics in landfill leachate

Source Title	Water Research
Source citation (APA Format)	He, P., Chen, L., Shao, L., Zhang, H., & Lü, F. (2019). Municipal solid waste (MSW) landfill: A source of microplastics? -evidence of microplastics in landfill leachate. *Water Research*, *159*, 38–45. https://doi.org/10.1016/j.watres.2019.04.060
Original URL	https://www-sciencedirect-com.ezpv7-web-p-u01.wpi.edu/science/article/pii/S004313541930377X
Source type	Article Journal
Keywords	Microplastic, landfill leachate
#Tags	#Microplastics
Summary of key points + notes (include methodology)	Plastics are an indispensable aspect of our lives, but lately, microplastics are increasing in marine life and the atmosphere due to the increase of production of plastic products. In order to decrease microplastic production, we need to understand the sources it comes from. Plastics come from human and waste management negligence, but it mostly comes from landfills, which are said to 21-42% of the global plastic waste management. A probable cause is that leachate dissolves the plastic and spreads it to the environment. Their methodology consisted of taking leachate samples from landfills and comparing it to the amount of microplastics that are in the atmosphere. If the amount of leachate is proportional with the amount of microplastics, than it can be assumed that the main source is leachate.
Research Question/Problem/ Need	Where does microplastics mainly come from?

Important Figures	 Proportion of 5 different shapes in leachate samples
VOCAB: (w/definition)	Landfill Leachate: a fluid that flows through landfill that dissolves toxic material Landfills: A place to dispose trash and other wastes
Cited references to follow up on	Alimi, O. S., Farner Budarz, J., Hernandez, L. M., & Tufenkji, N. (2018). Microplastics and nanoplastics in aquatic environments: aggregation, deposition, and enhanced contaminant transport. *Environmental science & technology*, *52*(4), 1704-1724. Antunes, J., Frias, J., & Sobral, P. (2018). Microplastics on the Portuguese coast. *Marine pollution bulletin*, *131*, 294-302.

Follow up Questions	How big of an impact does microplastics have on runners? What size will the impact be most lethal? Do I need a different type of filter for microplastics?

Patent #1: Air-pollution filter and face mask

Source Title	*Air-Pollution and Face Mask* (U.S. Patent No. US4141703A). U.S. Patent and Trademark Office.
Source citation (APA Format)	Mulchi, C.L. (1979). *Air-Pollution and Face Mask* (U.S. Patent No. US4141703A). U.S. Patent and Trademark Office. https://patents.google.com/patent/US4141703A/en
Original URL	https://patents.google.com/patent/US4141703A/en
Source type	Patent
Keywords	Air Pollution, RTV Silicone Products
#Tags	#PollutionPatent
Summary of key points + notes (include methodology)	This patent aims to address the constraints of the normal masks that are used today. As of right now, the masks only tend to filter out Particulate Matter. So, this study aimed to create a mask that would filter out all sorts of gases, similar to those in the military. They also aimed to make it comfortable and efficient. The methodology consists of a multitude of steps. The mask is made of a variety of moldable materials which are also flexible and elastic. This mask consists of a numerous number of small valves, where some of them are specifically for exhaling and inhaling. The material in this design is very thin so it can even filter out the smallest of particles. Materials are vinyl, plastic, polyamide, and more. The mesh also plays a big factor in filtering, as it also increases comfortability as well.
Research Question/Problem/ Need	How can we develop a mask that filters out a variety of gases?

Important Figures	

U.S. Patent Feb. 27, 1979 Sheet 1 of 3 4,141,703

FIG. 1.

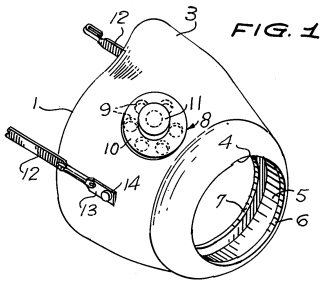


FIG. 2.

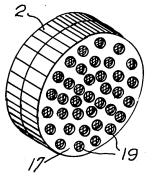
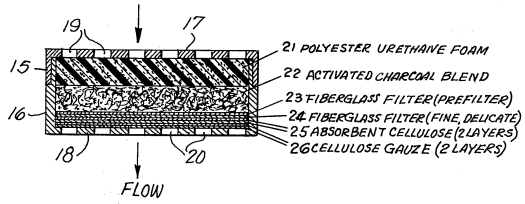
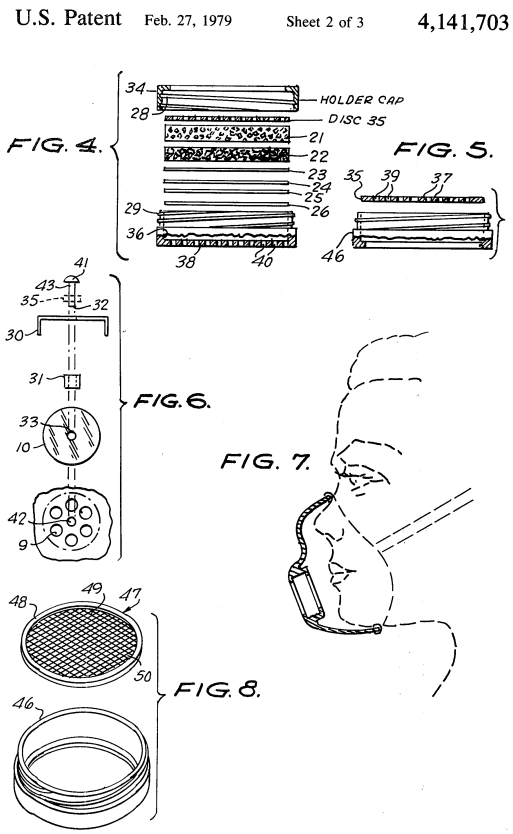


FIG. 3.

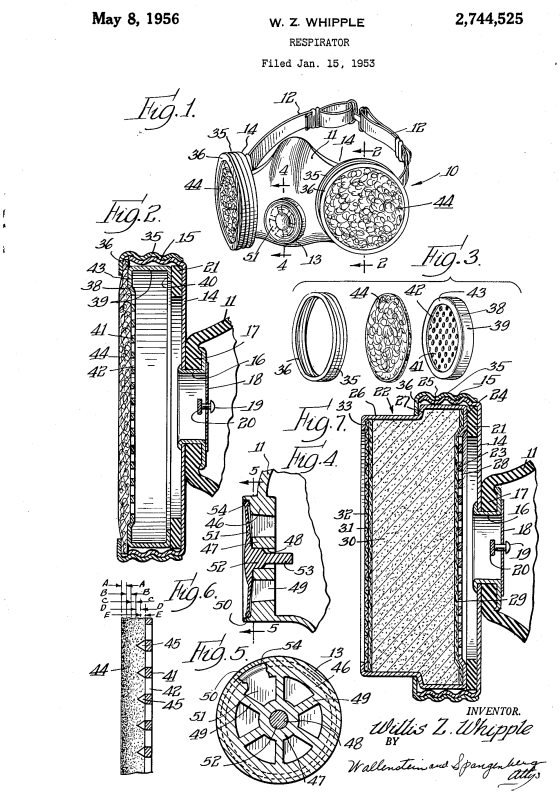


These figures show the in-depth structure of the mask. Figure 1 shows the broad design of the mask, 2 shows a clearer picture of the filters, and 3 shows the different materials used.

	 These show a clear breakdown of the components in the mask.
VOCAB: (w/definition)	RTV Silicon Products: A type of silicone used for manufacturing Cartridge: A container holding film or other substances for mechanisms
Cited references to follow up on	Jenness, L.G. (1933). *Air-purifying device* (U.S. Patent Office No.US1931989A). U.S. Patent and Trademark Office. https://patents.google.com/patent/US1931989A/en Whipple, W.Z. (1956). *Respirator* (U.S. Patent Office No.US2744525A). U.S. Patent and Trademark Office. https://patents.google.com/patent/US2744525A/en
Follow up Questions	How do I stop my mask from being too excessive and big? What is the perfect size for my specific mask? Will I able to keep the desired functions for my mask even it is smaller?

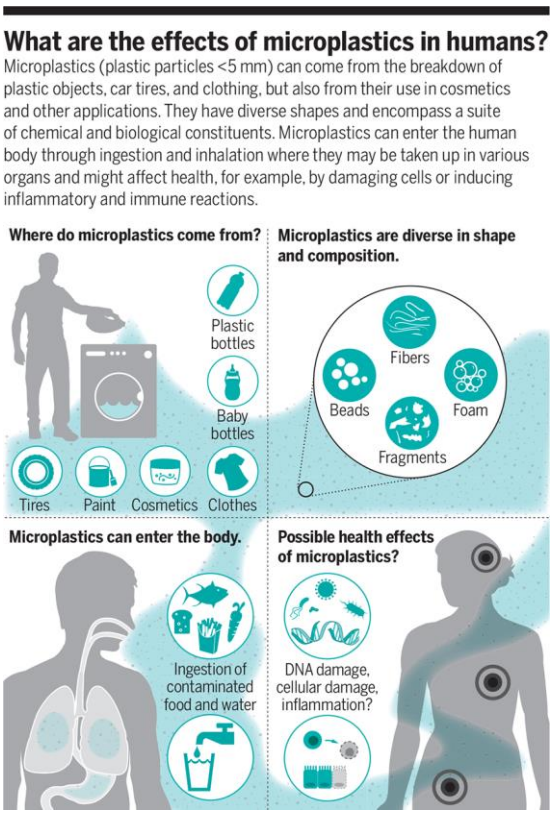
Patent #2: Respirator

Source Title	*Respirator* (U.S. Patent Office No.US2744525A). U.S. Patent and Trademark Office.
Source citation (APA Format)	Whipple, W.Z. (1956). *Respirator* (U.S. Patent Office No.US2744525A). U.S. Patent and Trademark Office. https://patents.google.com/patent/US2744525A/en
Original URL	https://patents.google.com/patent/US2744525A/en
Source type	Patent
Keywords	Respirator, Valves, Spokes
#Tags	#DustRespirator
Summary of key points + notes (include methodology)	In this patent, it strived to construct a respirator that would block out any dust with efficient filters, while at the same time, being inexpensive to manufacture. The f is made of molded rubber, and it covers the nose and the mouth of the user, it also has adjustable straps and an exhaled valve for exhaled breath. There is also inhale valves made of rubber where the inhaled breath goes through. There is a fibrous material in the mask which strives to absorb material when air is going through it. This would serve as the filter of the mask. The dust filter is in a circular shape, where it also contains cartridges. The exhale valve has a sort of spider-like shape. There is also a lot of supporting members and materials in this mask because it needs blocks to hold pieces up. There is a central hub where it comprises of openings and spokes.
Research Question/Problem/ Need	How can we develop a respirator that is inexpensive to manufacture?

Important Figures	 May 8, 1956 W. Z. WHIPPLE 2,744,525 RESPIRATOR Filed Jan. 15, 1953 Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7. INVENTOR. Willis Z. Whipple BY Wallenstein and Spangenberg Attys In this figure, it shows the different parts of the mask and what comprises of them. In Figure 1, we have the general shape of the mask with the two exhale and inhale valves. This figure also shows the annular rim and the dust filter
VOCAB: (w/definition)	Diaphragm: A muscle that is located near the lungs and the heart. It is the main muscle for breathing Annular Rim: It is usually a copper rim that connects two things
Cited references to follow up on	Matheson, J.N. (1961). *Respirator* (U.S. Patent Office No. US2999498A). U.S. Patent and Trademark Office. https://patents.google.com/patent/US2999498A/en Ackley, M.W. (1985). *Particulate air filter assembly* (U.S. Patent Office No. US4548626A). U.S. Patent and Trademark Office. https://patents.google.com/patent/US4548626A/en
Follow up Questions	What materials do I need for those valves? How thin does the filter need to be in order to block out particles? What are the most important features of a mask?

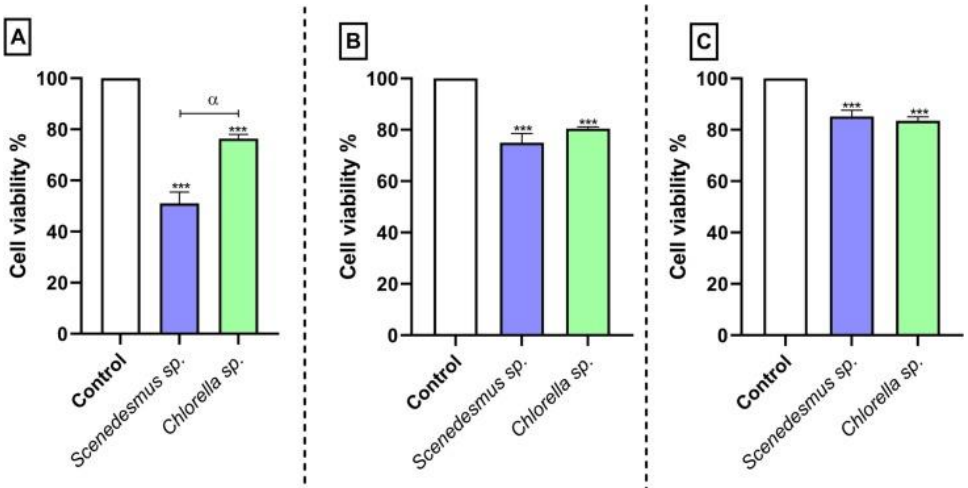
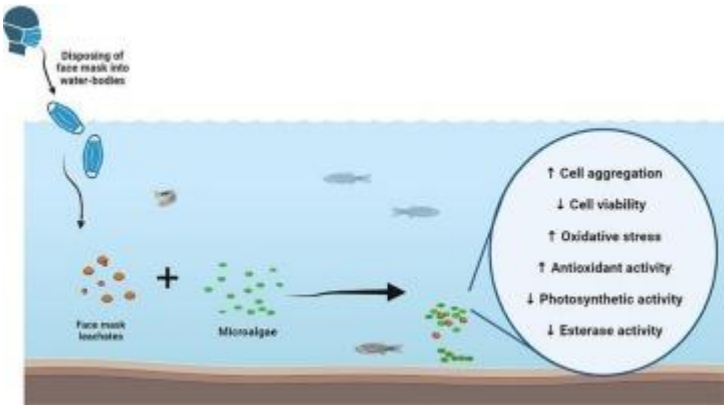
Article #11: Microplastics and Human Health

Source Title	Science
Source citation (APA Format)	Vethaak, A. D., & Legler, J. (2021). Microplastics and human health. *Science*, *371*(6530), 672–674. https://doi.org/10.1126/science.abe5041
Original URL	https://www-science-org.ezpv7-web-p-u01.wpi.edu/doi/10.1126/science.abe5041
Source type	Journal Article
Keywords	Microplastics, Human Health
#Tags	#MicroplasticEffectOnHumans
Summary of key points + notes (include methodology)	Microplastics originates from the breakdown of plastic objects, car tires, clothing, and many more manufactured items. These microplastics will disperse throughout the atmosphere. Because of this, microplastics are inhaled with every breath a human take. A problem is that there is a lack of information on human exposure to these microplastics and their effects on humans. It is speculated that they have similar effects as to other air pollution, such as PM 2.5. These effects consist of causing cardiovascular and lung issues, such as lung cancer. But there are also inadequate tools to properly measure the nano-sized microplastics in the atmosphere. Another possible effect microplastics may have been chemical toxicity, where they may inhabit toxic chemicals that will eventually be inhaled into the body, thus causing more diseases. But the underlying truth is that today's technology isn't sufficient enough to properly gauge the effect microplastics have on human health. But that doesn't mean we are far from achieving this goal. The technology of particle analysis is currently being developed and soon we may have an answer.
Research Question/Problem/ Need	What is the effect microplastics have on human health?

Important Figures	 Outlines the possible effects microplastics have on humans
VOCAB: (w/definition)	Ubiquity: Being everywhere or being very common Biofilm: A community of microorganisms that is attached to a surface
Cited references to follow up on	Koelmans, B., Pahl, S., Backhaus, T., Bessa, F., van Calster, G., Contzen, N., ... & Wright, S. (2019). *A scientific perspective on microplastics in nature and society*. SAPEA. Wright, S. L., & Kelly, F. J. (2017). Plastic and human health: a micro issue?. *Environmental science & technology*, *51*(12), 6634-6647.
Follow up Questions	What types of tools are needed to measure microplastics? Do they act similar to PM 2.5, in terms of filtration? Are they a risk when running?

Article #12: Unmasking effects of masks: Microplastics released from disposable surgical face masks induce toxic effects in microalgae

Source Title	Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology
Source citation (APA Format)	Das, S., Chandrasekaran, N., & Mukherjee, A. (2023). Unmasking effects of masks: Microplastics released from disposable surgical face masks induce toxic effects in microalgae scenedesmus obliquus and chlorella sp. *Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology*, *267*, 109587. https://doi.org/10.1016/j.cbpc.2023.109587
Original URL	https://www-sciencedirect-com.ezpv7-web-p-u01.wpi.edu/science/article/pii/S153204562300042X
Source type	Article Journal
Keywords	COVID 19; Disposable Face Masks; Polypropylene; Toxicity; Oxidative Stress
#Tags	#MicroplasticMask
Summary of key points + notes (include methodology)	During COVID times, the main types of masks used to protect against the disease were surgical masks. These surgical masks were made from plastic polymers such as polystyrene, polyethylene, and more. Whenever people would throw these masks out, environmental effects would wear and tear these masks down. This would lead to microplastics breaking away from the mask and releasing it into the atmosphere and contributing to the growing pollution. These microplastics would end up in freshwater algae, which was used in this study. The methodology of this study was to quantify and characterize microplastics from 3-layer masks and the toxicity effect on the algae. They then tested the algae's bodily functions to see if the microplastics had an effect on inhibiting them. After getting the results, it was shown that the algae's functions were significantly

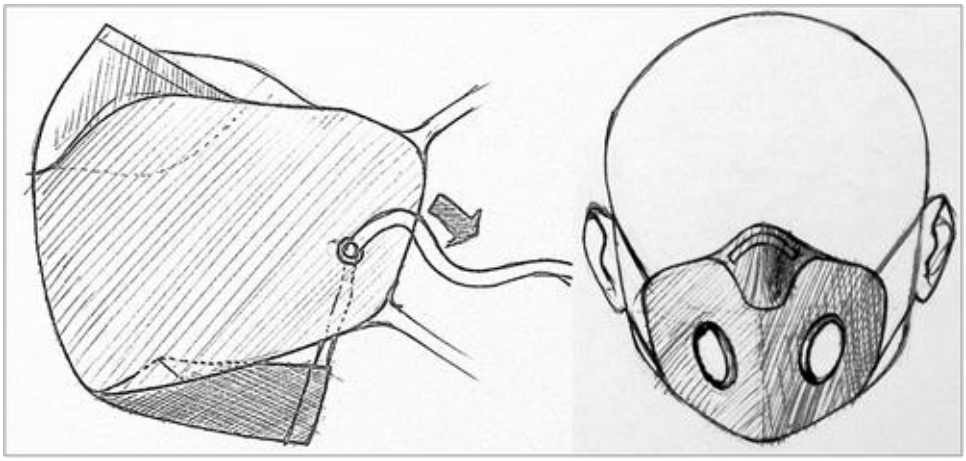
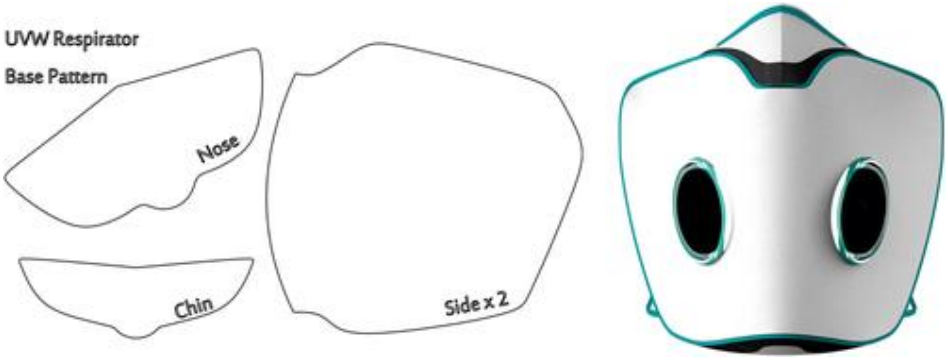
	reduced due to the microplastics spreading through their body.
Research Question/Problem/ Need	How do masks contribute to the production of microplastics in the atmosphere?
Important Figures	 Graphs for 3 layers of masks that show the decrease in cell viability for freshwater algae experiencing the effects of microplastics  A graphical abstract that depicts the impending results of when microplastics from face mask waste interacts with freshwater microalgae
VOCAB: (w/definition)	Oxidative Stress: A condition that occurs when there is an imbalance of free radicals and antioxidants in the body, leading to cell damage Intracellular: Within the cell
Cited references to follow up on	Aragaw, T. A. (2020). Surgical face masks as a potential source for microplastic pollution in the covid-19 scenario. *Marine Pollution Bulletin*,

	159, 111517. https://doi.org/10.1016/j.marpolbul.2020.111517 Arp, H. P., Kühnel, D., Rummel, C., MacLeod, M., Potthoff, A., Reichelt, S., Rojo-Nieto, E., Schmitt-Jansen, M., Sonnenberg, J., Toorman, E., & Jahnke, A. (2021). Weathering plastics as a planetary boundary threat: Exposure, fate, and Hazards. *Environmental Science & Technology*, *55*(11), 7246–7255. https://doi.org/10.1021/acs.est.1c01512
Follow up Questions	How big of priority should I place microplastics in my project? Should I try to reduce the amount of plastic used in the mask? What is the minimum amount of plastic needed?

Article 13: A study on usability and design parameters in face mask: Concept design of UVW face mask for COVID-19 protection

Source Title	Human Factors and Ergonomics in Manufacturing & Service Industries
Source citation (APA Format)	Ipaki, B., Merrikhpour, Z., Taheri Rizi, M. S., & Torkashvand, S. (2021). A study on usability and design parameters in face mask: Concept design of UVW face mask for Covid-19 protection. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *31*(6), 664–678. https://doi.org/10.1002/hfm.20934
Original URL	https://onlinelibrary.wiley.com/doi/10.1002/hfm.20934
Source type	Journal Article
Keywords	COVID 19, Transmission, Design Parameters

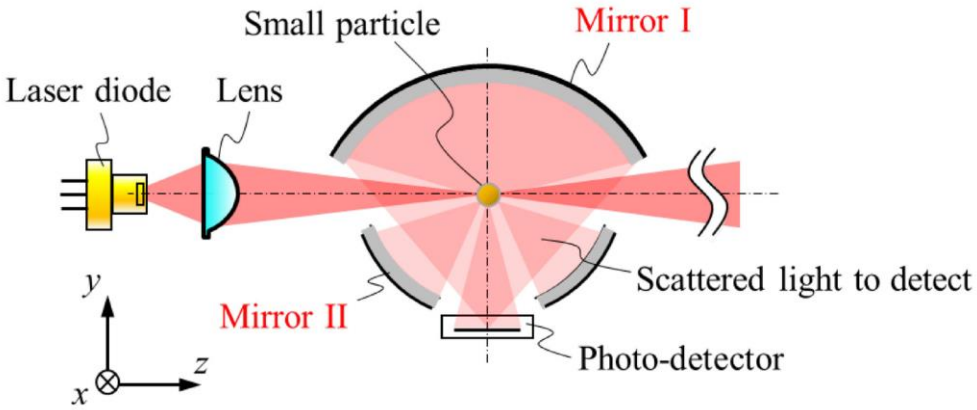
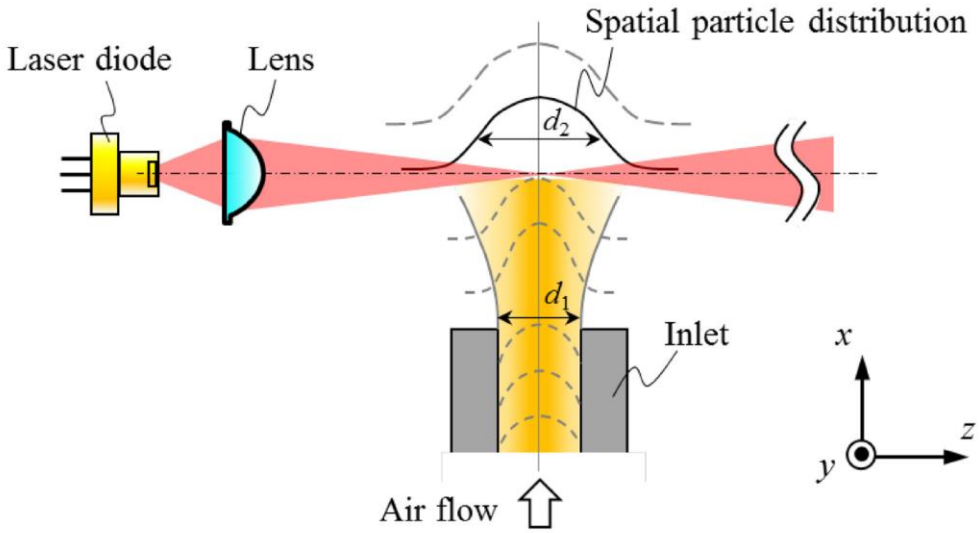
#Tags	#MaskDesign
Summary of key points + notes (include methodology)	During COVID-19, masks' design was imperative to assure the safety of all human beings. This is because breathing was the most common and most dangerous form of transmission for the COVID-19 virus. There were multiple designs that were tested against the infamous disease and satisfactory design parameters and criteria were developed in this study. The methodology of this study was gathering 115 Iranian men and women. These people would wear the N95 and surgical masks in public and would be asked for feedback. This was to determine the usability in each mask and to find out the drawbacks of each mask. One of the biggest forms of feedback the study received was the complaints about the breathing functions. Breathing was very difficult in some of those masks. Another problem was the sizes and how some didn't fit the faces of some participants. So, this study took 30 samples of jaw sizes and created a mask that was based on the general consensus of the jaw size. Materials, flexibility, and adjustability are also very imperative. Based on these issues, a mask called the UVW mask was manufactured to combat all these issues for the Iranian people.
Research Question/Problem/ Need	What modifications are needed to build a better mask against COVID-19 transmissions?

Important Figures	 The initial sketch of the UVW mask  The basic pattern of the UVW respirator
VOCAB: (w/definition)	Anthropometric: A study related to the proportions of the human body Design paradox: Attempted solutions to a problem that ultimately brings new problems
Cited references to follow up on	Applegate, W. B., & Ouslander, J. G. (2020). Covid-19 presents high risk to older persons. *Journal of the American Geriatrics Society*, *68*(4), 681–681. https://doi.org/10.1111/jgs.16426 Bernard Stoecklin, S., Rolland, P., Silue, Y., Mailles, A., Campese, C., Simondon, A., Mechain, M., Meurice, L., Nguyen, M., Bassi, C., Yamani, E., Behillil, S., Ismael, S., Nguyen, D., Malvy, D., Lescure, F. X., Georges, S., Lazarus, C., Tabaï, A., … Levy-Bruhl, D. (2020). First cases of coronavirus disease 2019 (COVID-19) in France: Surveillance, investigations and control measures, January 2020. *Eurosurveillance*, *25*(6). https://doi.org/10.2807/1560-7917.es.2020.25.6.2000094

Follow up Questions	Which aspects of the mask should be prioritized? What are the materials needed for each aspect? What is the specific design process?

Article 14: Stimulation study of optical detection of small particles by light scattering-type sensor with double-side mirror reflectors

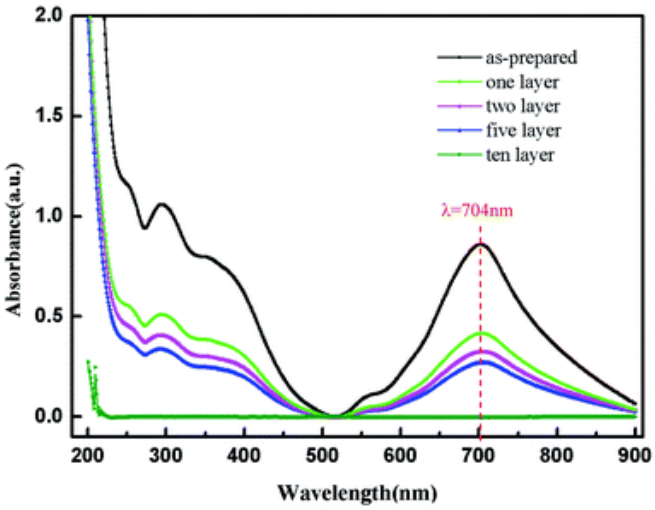
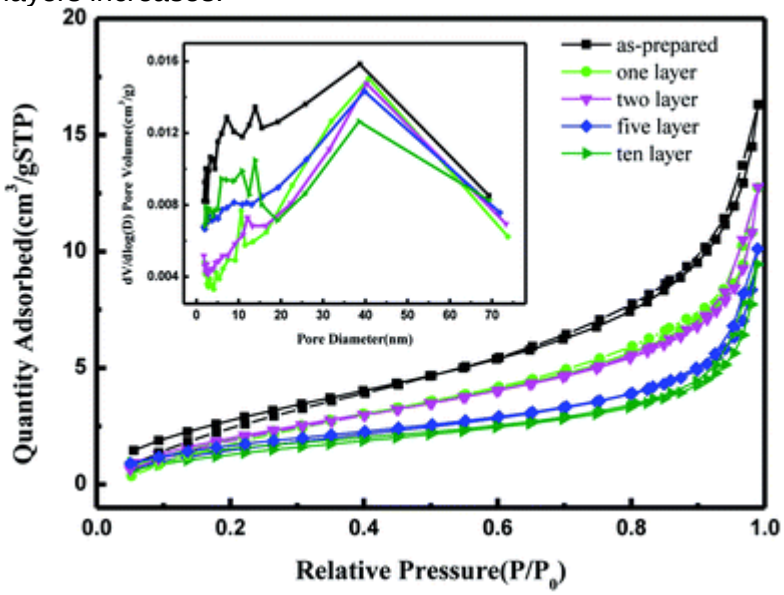
Source Title	Photonic Instrumentation Engineering
Source citation (APA Format)	Nakai, K., & Enoki, N. (2019). Simulation study of optical detection of small particles by light scattering-type sensor with double-side mirror reflectors. *Photonic Instrumentation Engineering VI*, *10925*, 37. https://doi.org/10.1117/12.2508272
Original URL	https://www-spiedigitallibrary-org.ezpv7-web-p-u01.wpi.edu/conference-proceedings-of-spie/10925/2508272/Simulation-study-of-optical-detection-of-small-particles-by-light/10.1117/12.2508272.full
Source type	Journal Article
Keywords	Photonic, Irradiation, Photodiode
#Tags	#LightTransmittance
Summary of key points + notes (include methodology)	With the rising air pollution, there is a need to detect the amount of air pollutants that are in the air. This is important because in order to recognize risk, the quantification of the air pollutants is imperative. In this study, a sensor was developed to track the amount of air pollutants that are in a specific region. This sensor was a light sensor. What this study did was to put a sensor in a controlled area with air pollutants and emit light into this area. When the light comes into contact with the particles, it will become scattered. So, the sensor was able to track the scattered light via the reflected mirrors in the area. With this data, quantifying the air particles is very plausible. Using a light-detection system seems like the most optimal solution in trying to count the number of particles.

Research Question/Problem/ Need	How can we quantify the amount of air pollutants in a certain area?
Important Figures	 A diagram of the sensor system  The spatial distribution of the particles
VOCAB: (w/definition)	Gravimetric: Relating to the measurement of weight Irradiation: Exposed to radiation
Cited references to follow up on	T. Takebayashi, K. Asakura and M. Yamada, "Exposure to PM2.5 and Effects on Human Health: Implications for Health Risk Assessment in Japan," J. Jpn. Soc. Atmos. Environ., 46 (2), 70 –76 (2011). Nakahara, S., Okagaki, S., Nakai, K., Enoki, N., & Takeshita, N. (2017). Examination of suppression of stray light of small PM2.5 sensor. *2017 IEEE International Conference on Consumer Electronics (ICCE)*, 51–52. https://doi.org/10.1109/icce.2017.7889226

Follow up Questions	Can I apply this to my project for testing? If so, what materials do I need? What kind of data would I need?

Article 15: Preparation for a multi-layer nylon-6 nanofibrous membranes by electrospinning and hot pressing methods for dye filtration

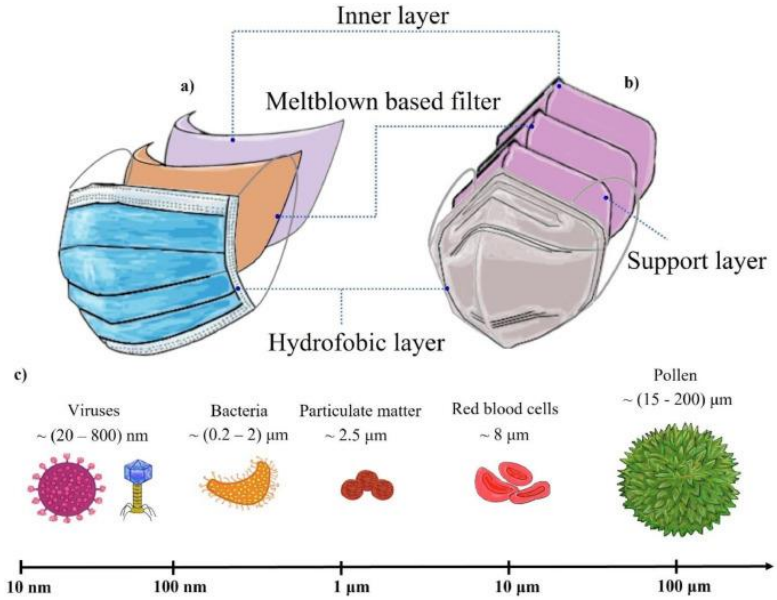
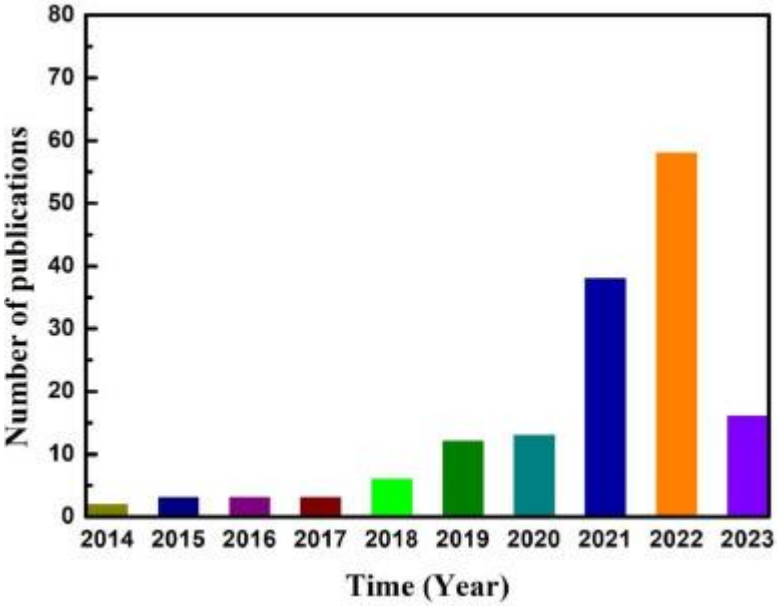
Source Title	RSC Advances
Source citation (APA Format)	Yu, Y., Ma, R., Yan, S., & Fang, J. (2018a). Preparation of multi-layer nylon-6 nanofibrous membranes by electrospinning and hot pressing methods for dye filtration. *RSC Advances*, *8*(22), 12173–12178. https://doi.org/10.1039/c8ra01442f
Original URL	https://pubs.rsc.org/en/content/articlelanding/2018/ra/c8ra01442f
Source type	Article Journal
Keywords	Nylon 6/6, Electrospinning, Nanofibrous
#Tags	#Nylon6/6Electrospinning
Summary of key points + notes (include methodology)	There is now increasing demand for electrospinning nanofibers. This is because electrospinning is one of the highest-quality filtration methods. They produce a nanofibrous polymer mesh that serves as a filter. Their properties consist of high surface area to volume ratios, large porosity, and good mechanical and water permeability. This study consisted of electrospinning nylon 6/6 to serve as a filtration mechanism. In their methodology, they dissolved the nylon 6/6 in a Formic acid solution to help prepare it to be electro spun. This solution was charged with 18 kilovolts. After the nanofibrous mesh was created, it was hot-pressed in an oven-like structure to remove the solvent residue. After analysis, the mesh was shown to have increased thickness with the increasing number of layers. The Nitrogen and

	pollutant absorption rate was also analyzed. Lastly, the engineers sent an indigo dye pollutant through the filter and analyzed it.
Research Question/Problem/ Need	What are the filtration qualities of a Nylon 6/6 electrospun nanofibrous mesh?
Important Figures	 The filtration efficiency of the filter with indigo dye as the amount of layers increases.  The filtration efficiency of the filter with nitrogen as the amount of layers increases
VOCAB: (w/definition)	Spectrophotometer: A device used to measure the amount of light that is absorbed after the light intensity is hampered by a substance Polarization: The property of transverse waves which specifies the geometrical orientation of the oscillations.
Cited references to follow up on	V. Thavasi , G. Singh and S. Ramakrishna , Electrospun nanofibers in

	energy and environmental applications, *Energy Environ. Sci.*, 2008, **1** , 205 —221 Q. P. Pham , U. Sharma and A. G. Mikos , Electrospinning of polymeric nanofibers for tissue engineering applications: a review, *Tissue Eng.*, 2006, **12** , 1197 —1211
Follow up Questions	What if I intend to use another polymer besides Nylon 6/6? Is Nylon 6/6 the best polymer to use purely for filtration methods? Is hot-pressing essential for the filter?

Article 16: Electrospun nanofibers for medical face mask with protection capabilities against viruses: State of the art and perspective for industrial scale-up

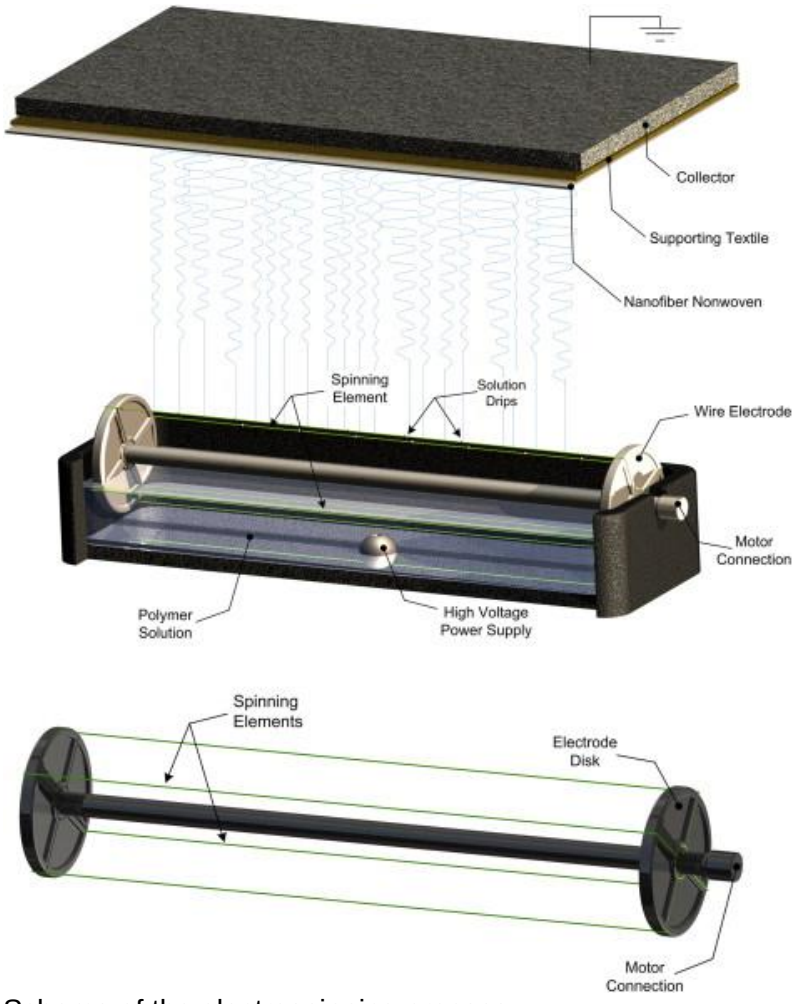
Source Title	Applied Materials Today
Source citation (APA Format)	Cimini, A., Imperi, E., Picano, A., & Rossi, M. (2023). Electrospun nanofibers for medical face mask with protection capabilities against viruses: State of the art and perspective for industrial scale-up. *Applied Materials Today*, *32*, 101833. https://doi.org/10.1016/j.apmt.2023.101833
Original URL	https://www.sciencedirect.com/science/article/pii/S2352940723001038
Source type	Journal Article
Keywords	Electrospinning, Nanofibers, Viruses
#Tags	#ElectrospunMaskForViruses
Summary of key points + notes (include methodology)	As the Corona Virus was prevalent in the years from 2019-2022, there was a high demand for a high-filtration mask that will be able to filter out viruses that are transmitted airborne, like the COVID disease. The size of a particle of the COVID disease is around 60 – 140 nm, so there is a demand for a filter that is able to fight against that. There are multiple layers that are standard for any face mask. Those layers are the hydrophobic layer, support layer, melt blown

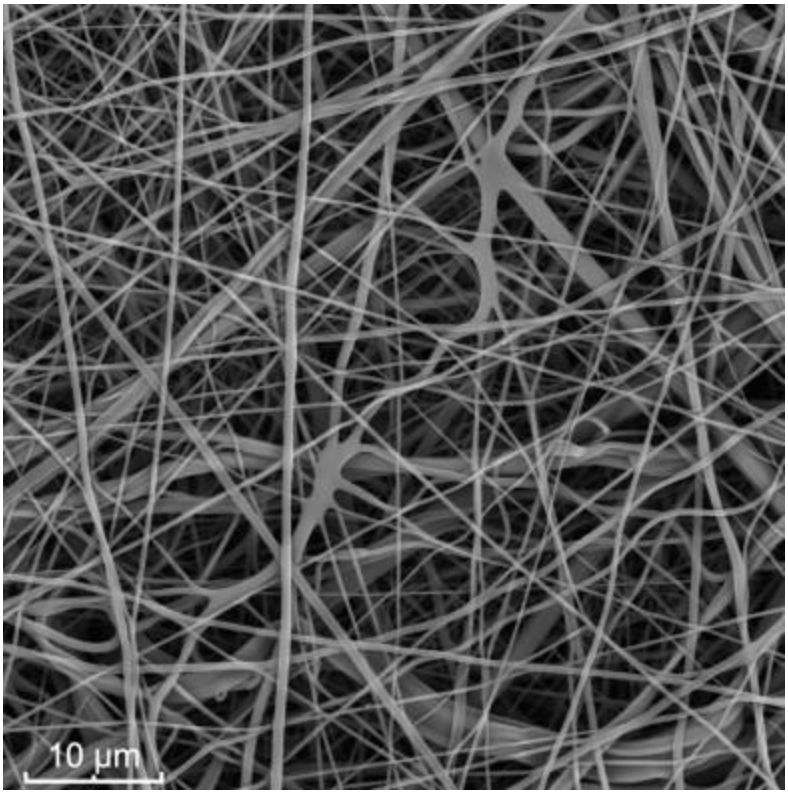
	face layer, and the inner layer. All of these layers play a crucial part in filtering out the small yet hazardous pollutants. This study uses electrospinning techniques for the filter of the mask. This study paid close attention to which polymer they wanted to use due to the high costs of each polymer. Overall, this study broke down each component of what to consider when developing a filtration mask. They also proved studies that masks were more efficient in filtration after using nanofibrous based methods.
Research Question/Problem/ Need	How effective is an electro spun nanofibrous-based mask against airborne diseases like COVID?
Important Figures	 Key layers of filtration in a mask  Number of masks that use electrospinning methods over the years, justifies the use and the popularity

VOCAB: (w/definition)	Diffusion: A substance that goes from a high concentration area to a low concentration area Volumetric: Relating to the measurement of volume
Cited references to follow up on	Ippolito, M., Vitale, F., Accurso, G., Iozzo, P., Gregoretti, C., Giarratano, A., & Cortegiani, A. (2020). Medical masks and Respirators for the Protection of Healthcare Workers from SARS-CoV-2 and other viruses. *Pulmonology*, *26*(4), 204-212. Bandiera, L., Pavar, G., Pisetta, G., Otomo, S., Mangano, E., Seckl, J. R., ... & Viola, I. M. (2020). Face coverings and respiratory tract droplet dispersion. *Royal Society open science*, *7*(12), 201663.
Follow up Questions	What polymer is best for PM 2.5 filtration? What solvent do I need to dissolve it in? Are viruses something I want to incorporate in my project?

Article 17: 3D modeling of filtration process via polyurethane nanofiber based nonwoven filters prepared by electrospinning process

Source Title	Chemical Engineering Science
Source citation (APA Format)	Sambaer, W., Zatloukal, M., & Kimmer, D. (2011b). 3D modeling of filtration process via polyurethane nanofiber based nonwoven filters prepared by electrospinning process. *Chemical Engineering Science*, *66*(4), 613–623. https://doi.org/10.1016/j.ces.2010.10.035
Original URL	https://www.sciencedirect.com/science/article/abs/pii/S0009250910006299?via%3Dihub
Source type	Journal Article
Keywords	Electrospinning, PU nanofiber nonwoven, Filtration, Digital image analysis, 3D filtration modeling, Slip flow
#Tags	#Electrospinning
Summary of key	This study includes a model of particle filtration through polyurethane nanofiber filters.

points + notes (include methodology)	They made a model that accounts for various flow sections, including slip, transition, and free molecular flow, and incorporates factors such as particle-fiber interactions, air-particle slip, sieving, and a homogeneous flow field. To accurately represent the filter's structure, they constructed a 3D nanofiber mat model using SEM images, capturing real structural features like varying fiber diameters and curvature. The predictions of filtration efficiency were compared with the experimental data, and they investigated the effects of parameters like air velocity, viscosity, temperature, pressure, and particle-fiber friction coefficient on filter performance.
Research Question/Problem / Need	How can a 3D particle filtration model be developed for polyurethane nanofiber filters produced through electrospinning, considering the factors that were listed?
Important Figures	 Scheme of the electrospinning process

	 Zoomed in photo of the nanofiber material
VOCAB: (w/definition)	Slip Flow: thermal flow that occurs when the temperature is not uniform SEM: Scanning Electron Microscope
Cited references to follow up on	Altmann, J., & Ripperger, S. (1997). Particle deposition and layer formation at the crossflow microfiltration. *Journal of Membrane Science*, *124*(1), 119–128. https://doi.org/10.1016/s0376-7388(96)00235-9 Ashari, A., & Vahedi Tafreshi, H. (2009). A two-scale modeling of motion-induced fluid release from thin fibrous porous media. *Chemical Engineering Science*, *64*(9), 2067–2075. https://doi.org/10.1016/j.ces.2009.01.048
Follow up Questions	How can I apply this in my project? Do I need to worry about 3D particle filtration models? What else do I need to know about electro spinning

Article 18: Face Mask Ventilation: A Comparison of Three Techniques

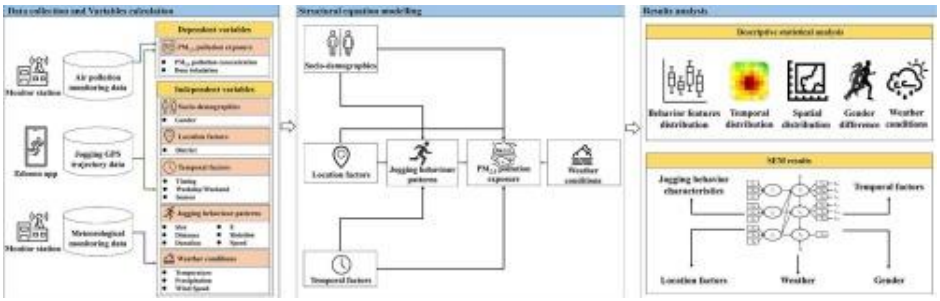
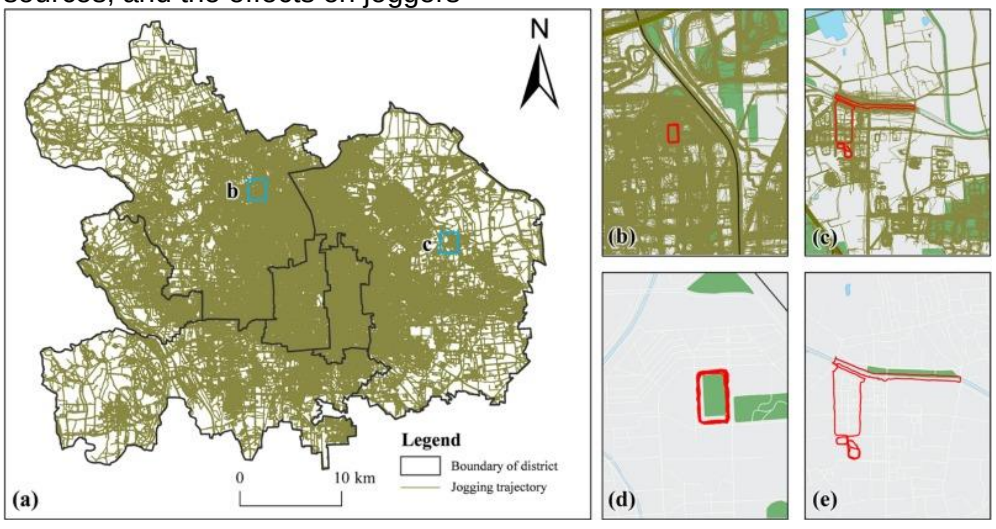
Source Title	The Journal Emergency Medicine
Source citation (APA Format)	Hart, D., Reardon, R., Ward, C., & Miner, J. (2013). Face mask ventilation: A comparison of three techniques. *The Journal of Emergency Medicine*, *44*(5), 1028–1033. https://doi.org/10.1016/j.jemermed.2012.11.005
Original URL	https://www.sciencedirect.com/science/article/pii/S0736467912014436?casa_token=nk3EBCX23TcAAAAA:ouJOl_zDpHFdpC-GBHngEpIKoaF6ImAcsfjGcVK2LPp6LqHKRk2VYMIidGYgOoc5huZIDR8e6A
Source type	Journal Article
Keywords	Bag-Valve Mask, Ventilation, Simulation
#Tags	#Bag-Valve Mask
Summary of key points + notes (include methodology)	In this study, they explored different methods of providing the most optimal ventilation for different positions while using the bag-valve mask. They compared the effectiveness of a mask seal using three different FM techniques on a simulated model. Their methodology consisted of randomizing health care patients. They used a mannequin to simulate a patient, and they measured the airway pressure of the patient and the volume of the ventilation. The results they received were that using two-handed techniques are more efficient than using one hand-techniques in order for proper airflow to ventilate throughout the patient. Using this model of FM ventilation was proven as effective to properly simulate ventilation of a patient.
Research Question/Problem/ Need	What is the most optimal technique for performing FM ventilation?

Important Figures	 One-handed CE Technique  Two-handed CE Technique
VOCAB: (w/definition)	FM : Face Mask, or Bag-valve mask C-E: A technique used for bag-valve ventilation
Cited references to follow up on	Tracy, M. B., Klimek, J., Coughtrey, H., Shingde, V., Ponnampalam, G., Hinder, M., Maheshwari, R., & Tracy, S. K. (2010). Mask leak in one-person mask ventilation compared to two-person in newborn infant manikin study. *Archives of Disease in*

	Childhood - Fetal and Neonatal Edition, *96*(3). https://doi.org/10.1136/adc.2009.169847 Davidovic, L., LaCovey, D., & Pitetti, R. D. (2005). Comparison of 1- versus 2-person bag-valve-mask techniques for manikin ventilation of infants and children. *Annals of Emergency Medicine*, *46*(1), 37–42. https://doi.org/10.1016/j.annemergmed.2005.02.005
Follow up Questions	Is the bag-valve something I should consider in my project? What are the pros and cons? Will it benefit the runner more than a two-valve mask?

Article 19: Association between outdoor jogging behavior and PM2.5 exposure: Evidence from massive GPS trajectory data in Beijing

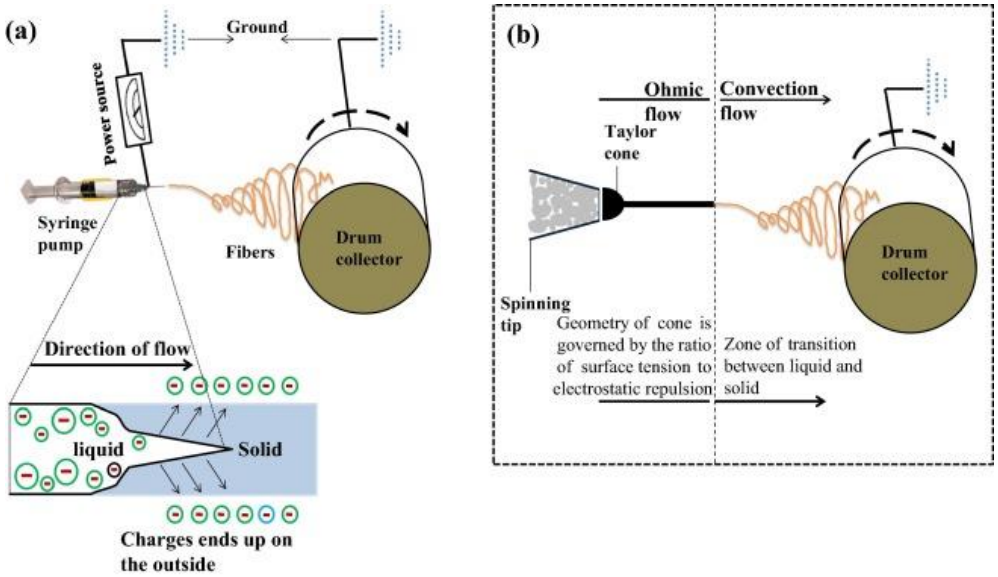
Source Title	Science of the Total Environment
Source citation (APA Format)	Guo, W., He, J., & Yang, W. (2024). Association between outdoor jogging behavior and PM2.5 exposure: Evidence from massive GPS trajectory data in Beijing. *Science of The Total Environment*, *947*, 174759. https://doi.org/10.1016/j.scitotenv.2024.174759
Original URL	https://www.sciencedirect.com/science/article/abs/pii/S0048969724049088
Source type	Journal Article
Keywords	Joggers, PM2.5, GPS trajectory
#Tags	#Jogging PM 2.5

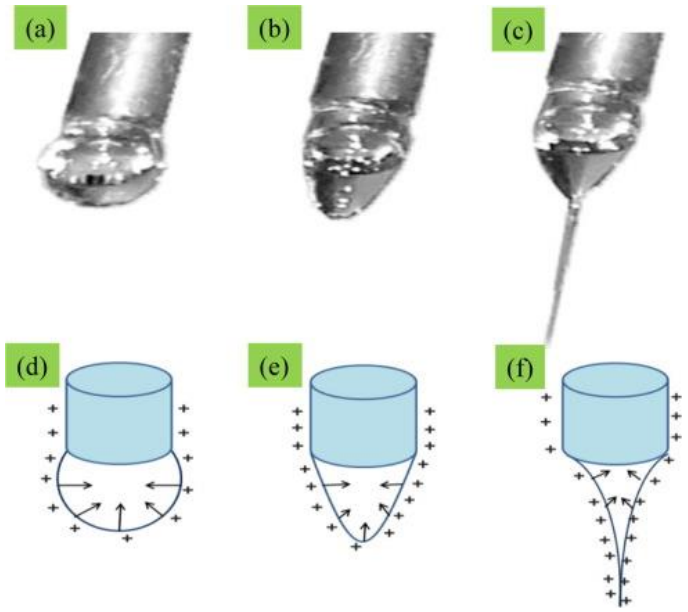
Summary of key points + notes (include methodology)	This study investigates how outdoor jogging patterns in Beijing relate with being exposed to PM 2.5 in the atmosphere. With the growing economic pollution, more industrial exhaust is being emitted into the atmosphere. This contributed towards the growing PM2.5, the most prevalent pollutant to come from exhaust. Using GPS trajectory data, the scientists analyzed jogging routes and times to analyze PM2.5 concentrations along these paths. The findings show that joggers are often exposed to higher PM2.5 levels compared to the general people, especially during traffic hours. This is due to cars emitting large amounts of smoke and pollution into the atmosphere during these hours. This shows that outdoor jogging in urban areas may have health risks due to elevated air pollution. Inhaling large amounts of these PM 2.5 particles could result in heart attacks, lung cancer, and other respiratory diseases. There is a need for re-designing urban areas that consider air quality to promote safer outdoor physical activities. This may include reducing the need to emit large amounts of air pollution. In conclusion, physical exercise like jogging helps to prevent the spread of diseases.
Research Question/Problem/ Need	What is the effect of PM 2.5 on joggers?
Important Figures	 Dependent and Independent variables of air pollution, PM 2.5 effects and sources, and the effects on joggers 

	Jogging GPS trajectory data in (a) the study area. (b) Tsinguah University, (c) Dongba community, (d) a playground, and (e) a street
VOCAB: (w/definition)	Spatiotemporal: Relating to both space-time Ambient: Immediate surroundings of something
Cited references to follow up on	Al-sareji, O. J., Grmasha, R. A., Hashim, K. S., Salman, J. M., & Al-Juboori, R. A. (2022). Personal exposure and inhalation doses to PM1 and PM2.5 pollution in Iraq: An examination of four transport modes. *Building and Environment*, *212*, 108847. https://doi.org/10.1016/j.buildenv.2022.108847 Guo, W., Chai, Y., & Kwan, M.-P. (2020). Travel-related exposure to air pollution and its socio-environmental inequalities: Evidence from a week-long GPS-based Travel Diary Dataset. *Spatiotemporal Analysis of Air Pollution and Its Application in Public Health*, 293–309. https://doi.org/10.1016/b978-0-12-815822-7.00013-3
Follow up Questions	Would jogging be any different from running in my project? Should I adjust my testing with this? How would it produce different results?

Article 20: A comprehensive review summarizing the effect of electrospinning parameters and potential applications of nanofibers in biomedical and biotechnology

Source Title	Arabian Journal of Chemistry
Source citation (APA Format)	Haider, A., Haider, S., & Kang, I.-K. (2018). A comprehensive review summarizing the effect of electrospinning parameters and potential applications of nanofibers in biomedical and biotechnology. *Arabian Journal of Chemistry*, *11*(8), 1165–1188. https://doi.org/10.1016/j.arabjc.2015.11.015
Original URL	https://www.sciencedirect.com/science/article/pii/S1878535215003275

Source type	Journal Article
Keywords	Electrospinning; Parameters Effect; Biomedical Applications
#Tags	#Electrospinning
Summary of key points + notes (include methodology)	This article determines the effect of various electrospinning parameters on nanofiber properties and their applications. Through research, the authors analyzed factors like the strength of an electric field, needle to collector distance, flow rate, solution viscosity, fiber morphology, diameter, and alignment. As nanofiber technology is growing increasingly more popular, more nanofibrous materials are being implemented in many fields. They are very popular for their diverse use in many biology-related fields and helping advance their technology. They found that increasing the electric field reduces fiber diameter, while adjusting the needle-to-collector distance can affect alignment. The study emphasized the versatility and flexibility of electro spun nanofibers in biomedical fields, such as tissue engineering, drug delivery, and wound healing, due to their high surface area and porosity, which mimic extracellular matrices. Additionally, the study detailed biotech uses, including biosensors and bio separation, where nanofibers enhance sensitivity and efficiency.
Research Question/Problem/ Need	What are the effects and applications of nanofibers in biomedical fields?
Important Figures	 Electrospinning Process

	 Close-up of the syringe dispenser
VOCAB: (w/definition)	Morphology: study of organisms and bones Coulomb Force: Amount of force between two electrically charged particles at rest
Cited references to follow up on	Abdelgawad, A. M., Hudson, S. M., & Rojas, O. J. (2014). Antimicrobial wound dressing nanofiber mats from multicomponent (Chitosan/Silver-NPS/Polyvinyl Alcohol) Systems. *Carbohydrate Polymers*, *100*, 166–178. https://doi.org/10.1016/j.carbpol.2012.12.043 Aliabadi, M., Irani, M., Ismaeili, J., Piri, H., & Parnian, M. J. (2013). Electrospun nanofiber membrane of PEO/Chitosan for the adsorption of nickel, cadmium, lead and copper ions from aqueous solution. *Chemical Engineering Journal*, *220*, 237–243. https://doi.org/10.1016/j.cej.2013.01.021
Follow up Questions	What other techniques do I need to know about electrospinning? Where can I practice electrospinning? What other materials do I need?