



Guardians of the Planet: Monitoring Environmental Impacts and Investigating Air-Soil-Water Systems Pollutions



We constantly hear alarming reports of environmental pollution in the news, with air, water, and soil contamination escalating to dangerous levels.





Guardians of the Planet: Careers in Combating Pollution



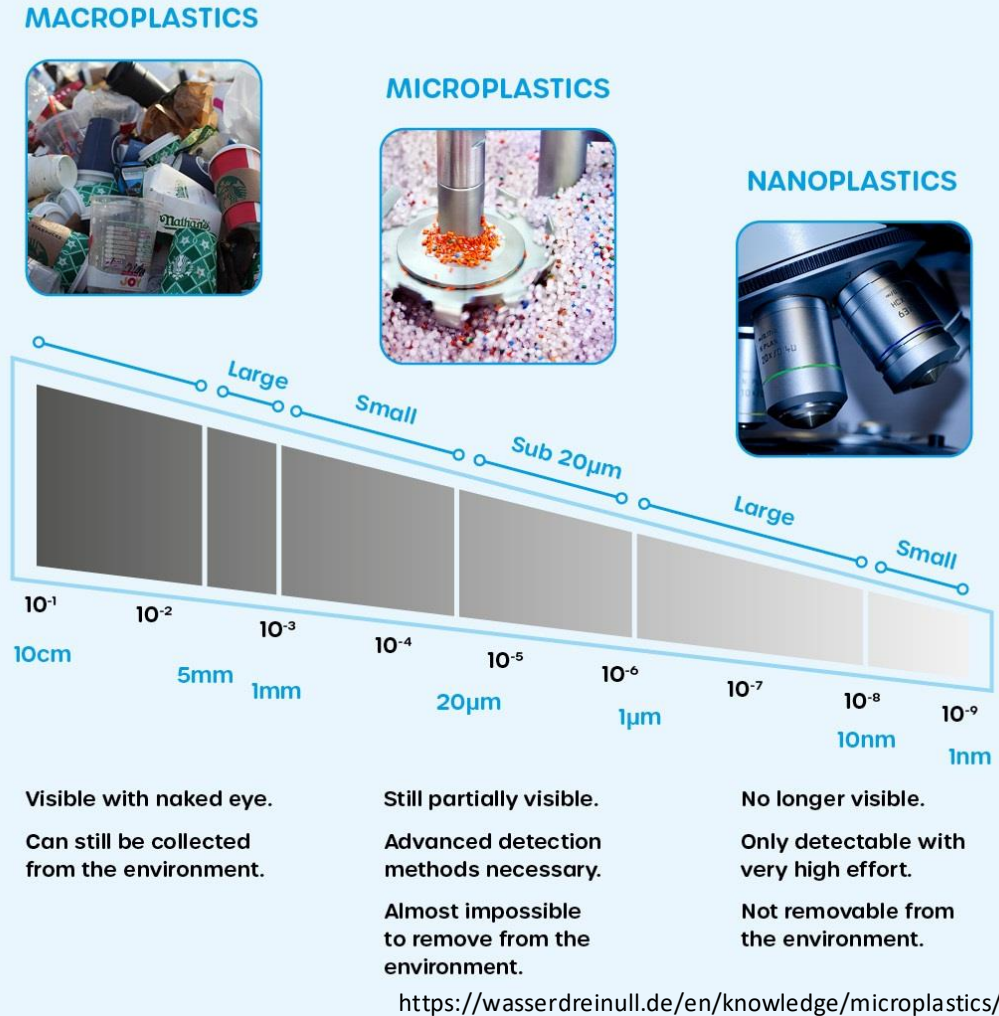
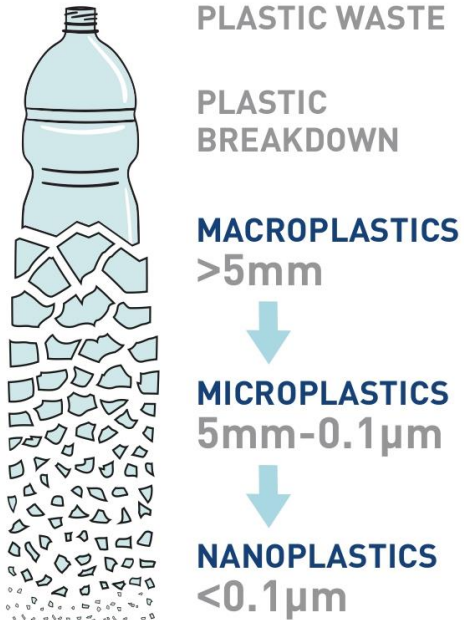
Monitor and investigate pollution in air, water, and soil, developing solutions to mitigate environmental damage and promote sustainability.





Innovative Research by Dr. Jazaei: Advancements at the University of Memphis

Investigates pollution in air, water, and soil systems, with a particular focus on microplastic pollution and its transport in the environment.





Microplastic has several origins, just some examples ...



WEAR AND TEAR OF TIRES



BIOSOLID
USAGE AS
FERTILIZER



LAUNDRY OF PLASTIC FABRICS



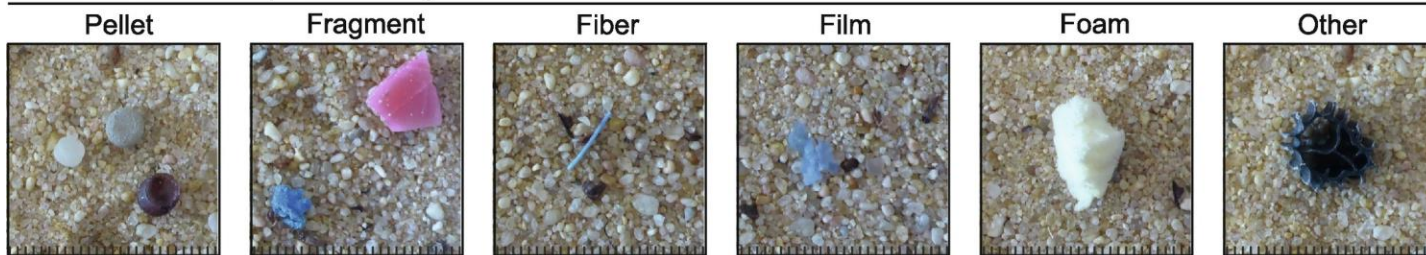


Microplastics Are in Different Shapes, Sizes, and Types

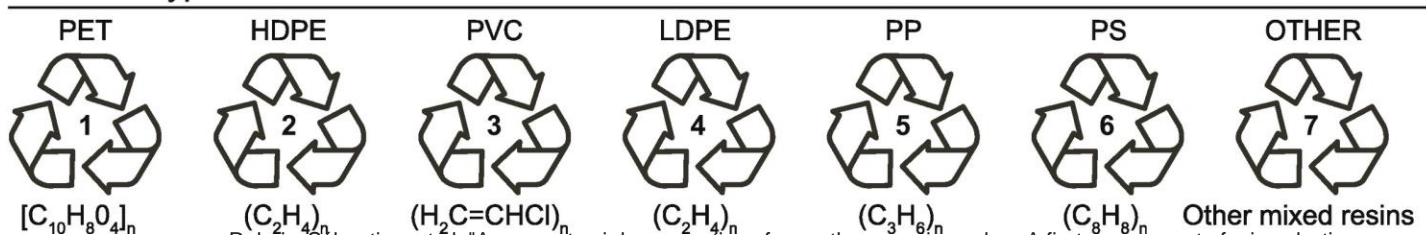
A. Plastic and sediment grain-size (mm)

in mm	Microplastic														
	Nanoplastic		SMP					LMP			Megaplastic				
	0.001							1.0			1000.0				
	Mud		Silt					Sand			Gravel				
	Clay		Very fine	Fine	Medium	Coarse	Very fine	Fine	Medium	Coarse	Very coarse	Granule	Pebble	Cobble	Boulder
	0.0039	0.0078	0.0156	0.031	0.0625	0.125	0.250	0.500	1.0	2.0	4.0	64.0	256.0	1000.0	

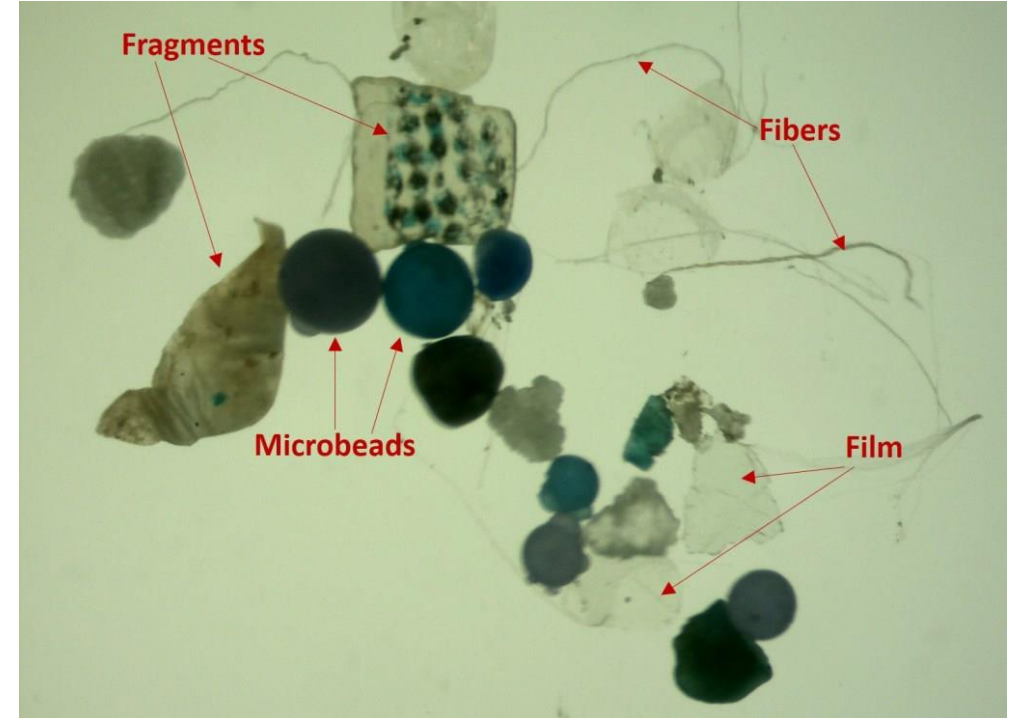
B. Meso- to microplastic shapes



C. Plastic types



Rohais, Sébastien, et al. "A source-to-sink perspective of an anthropogenic marker: A first assessment of microplastics concentration, pathways, and accumulation across the environment." *Earth-Science Reviews* (2024): 104822.



<https://www.agatemag.com/2021/05/microplastics-proliferate-in-lake-superior/>



Dr. Jazaei's Microplastic Research Areas



Microplastic
quantification in air,
water, and soil

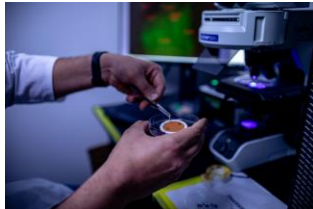
**Dr. Jazaei's
Microplastic
Research
Areas**

Microplastic
Environmental
Impact on Soil
Health

Microplastic
Transport
Mechanism

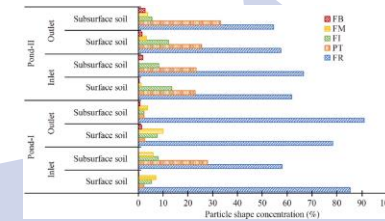


Dr. Jazaei's Team Investigating Microplastic Pollution in Soil, Water, and Air



Microplastic separation

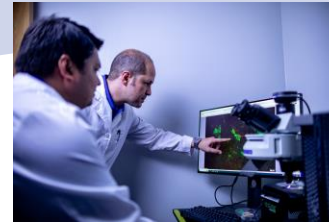
Analytical Interpretation



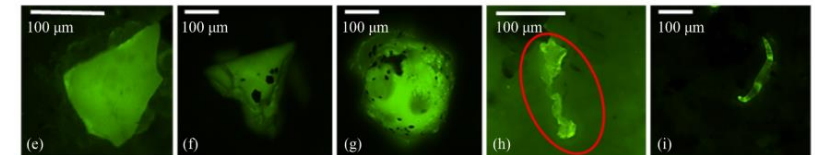
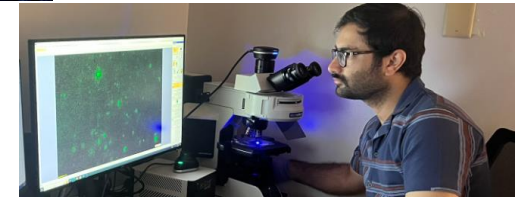
MICROPLASTIC QUANTIFICATION



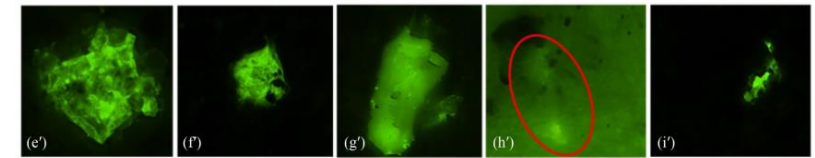
Fluorescent microscopy, MicroFTIR



Sampling



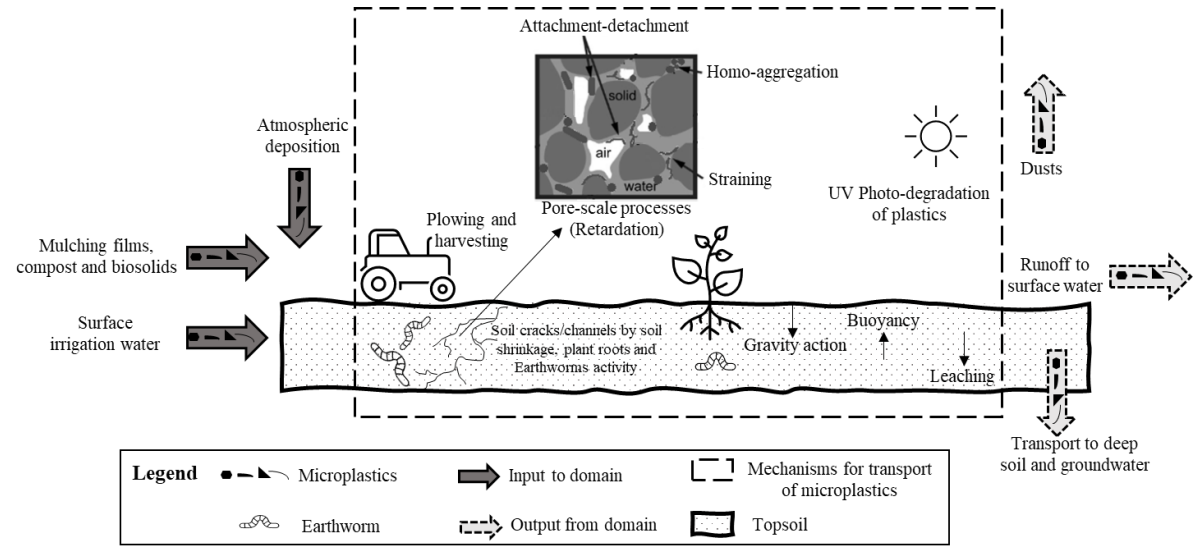
MP post hot plate test



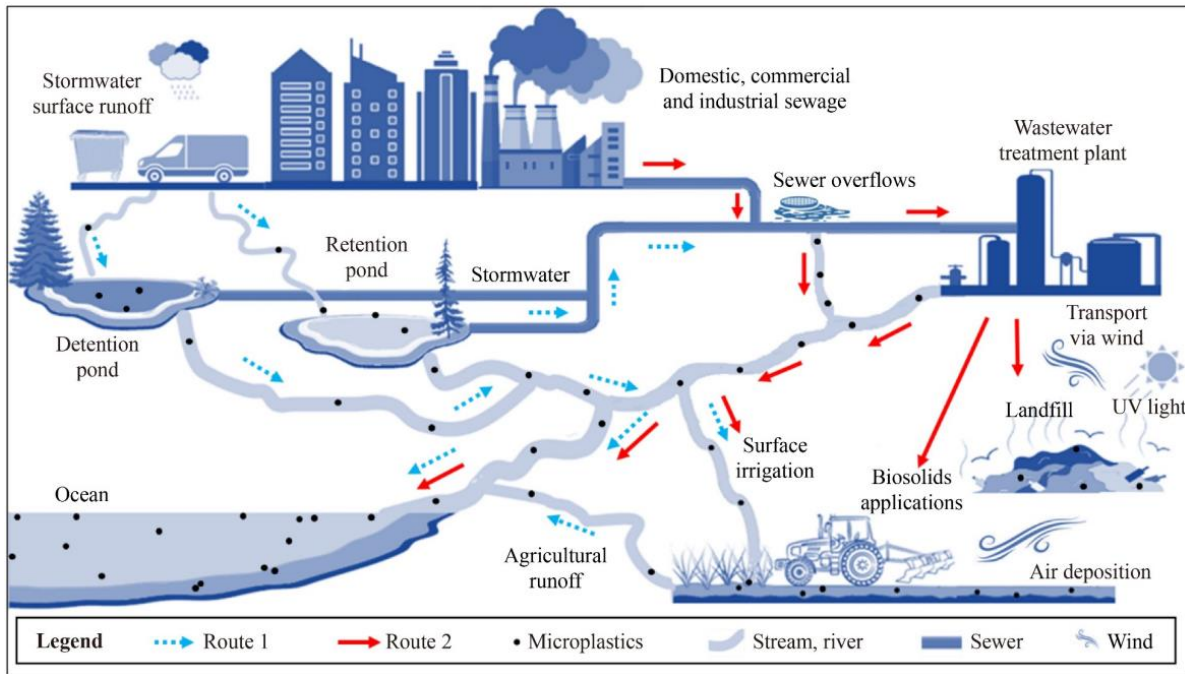


Microplastic Transport: Movement Through Air and Water Forces

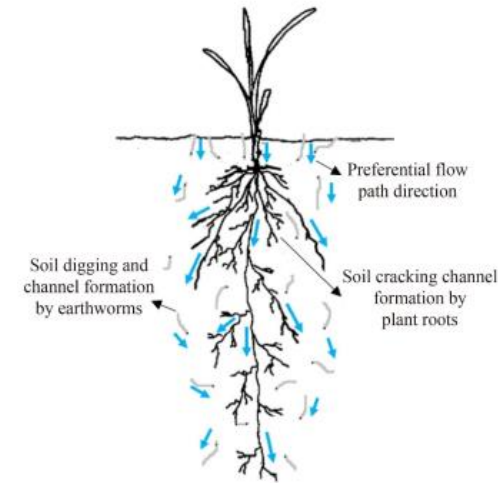
Microplastics are transported through the environment via forces exerted by air and water.



MICROPLASTIC TRANSPORT IN AGRICULTURE FARMS



MICROPLASTIC TRANSPORT IN URBAN ENVIRONMENTS



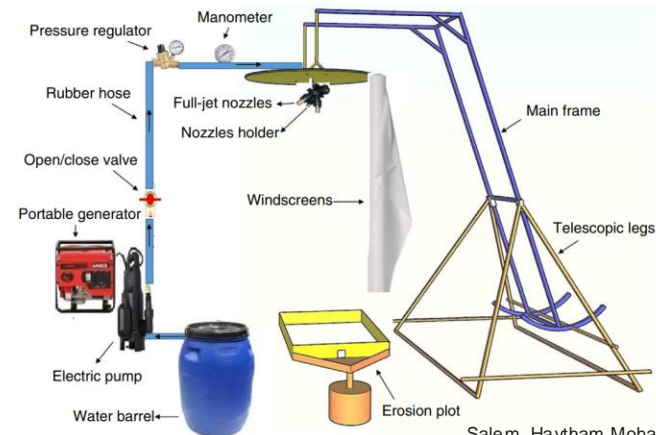
MICROPLASTIC TRANSPORT IN GRASS ROOT ZONE



Dr. Jazaei's Team Investigating Microplastic Transport via Runoff and Infiltration



MICROPLASTIC TRANSPORT IN FARM RUNOFF in DIFFERENT REAL CONDITIONS

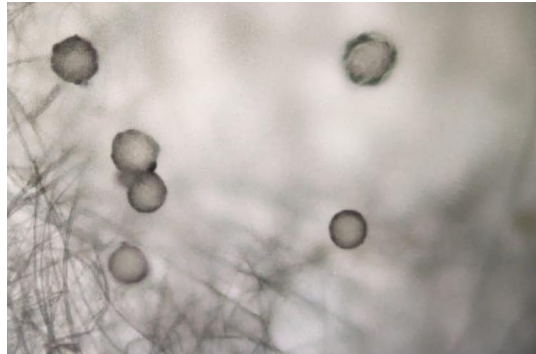
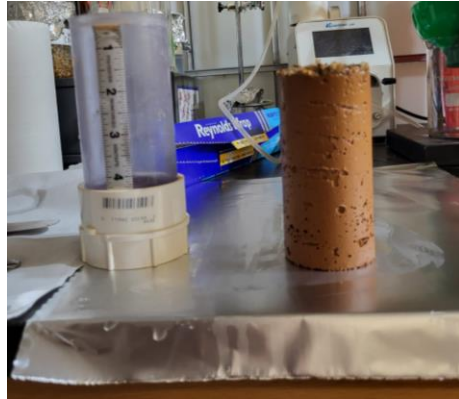


Salem, Haytham Mohamed, et al. "Initial effect of shifting from traditional to no-tillage on runoff retention and sediment reduction under rainfall simulation." *Soil Research* 60.6 (2021): 547-560.

MICROPLASTIC TRANSPORT IN FARM RUNOFF in DIFFERENT RAINFALL CONDITIONS USING A RAINFALL SIMULATOR

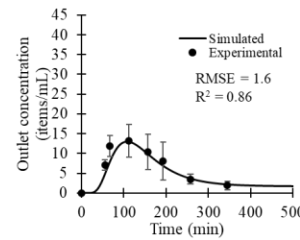


Dr. Jazaei's Team Modeling Microplastic Transport in Soil Columns

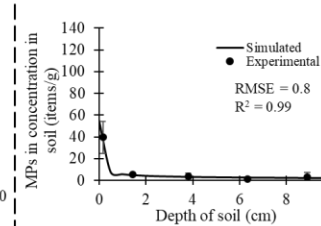
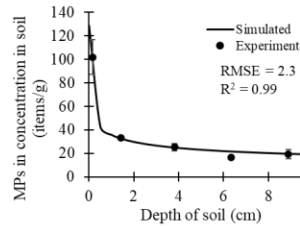
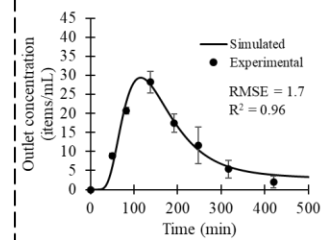


Sandy Loam

Condition: New MPs, DI water

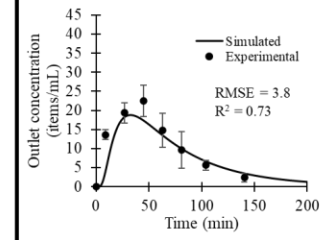


Condition: Degraded MPs, Humic Acid Solution

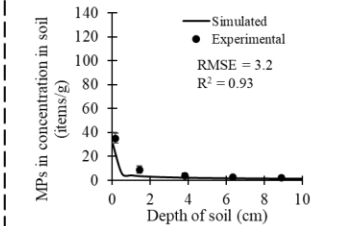
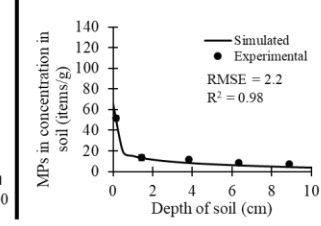
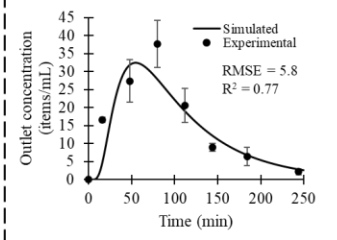


Loamy Sand

Condition: New MPs, DI water



Condition: Degraded MPs, Humic Acid Solution



NUMERICAL MODELING OF MICROPLASTIC TRANSPORT IN SOIL PORE STRUCTURE



Dr. Jazaei's Team Investigating Impacts of Microplastic on Soil Pore Scale Mechanisms

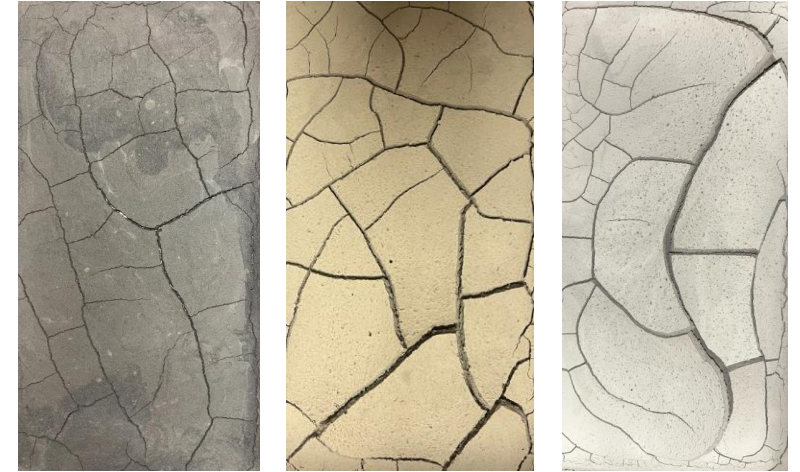
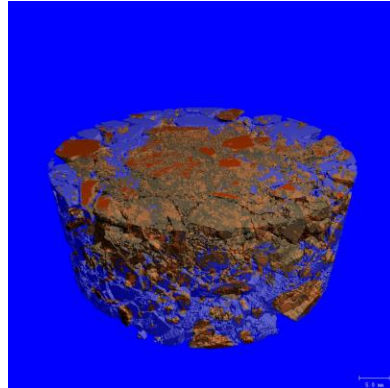
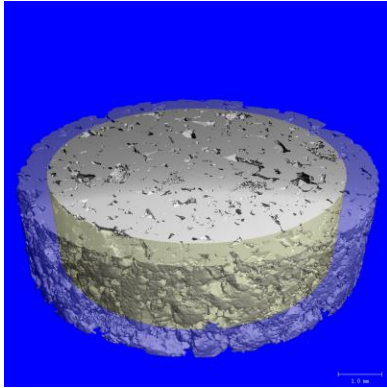
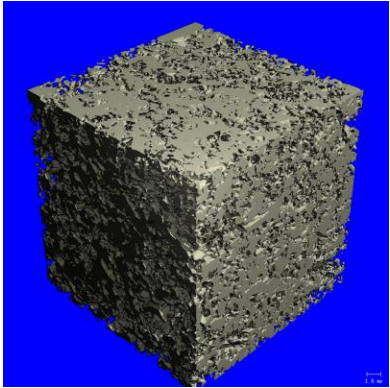


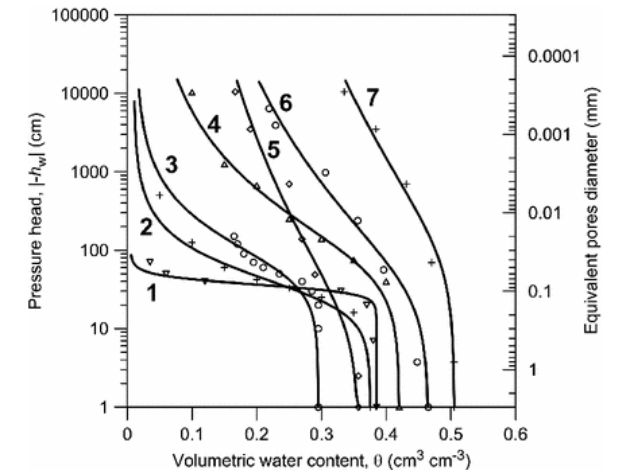
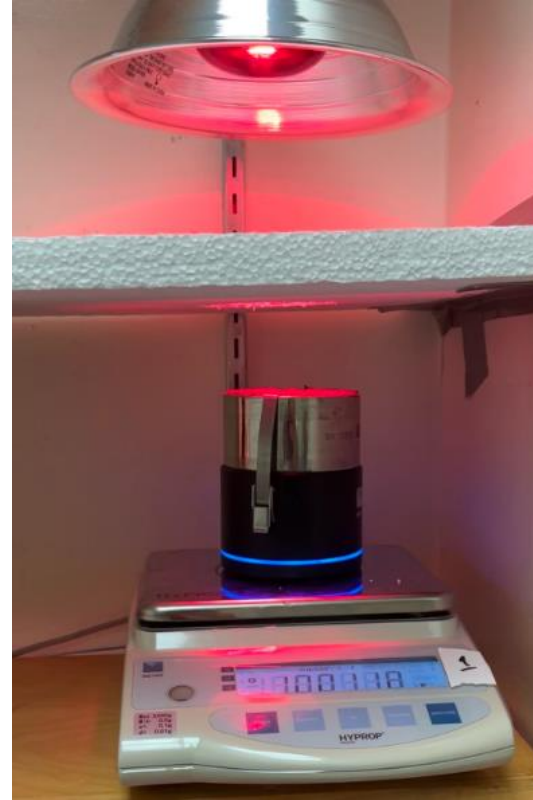
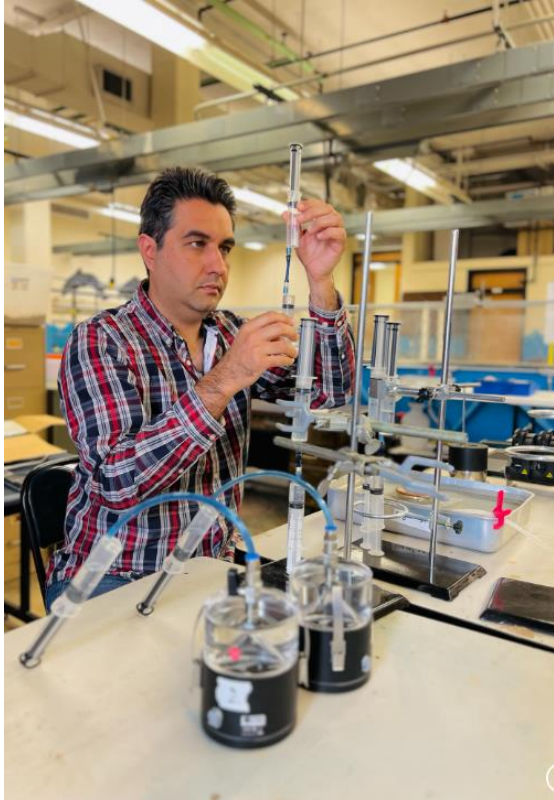
IMAGE ANALYSES AND NUMERICAL MODELING FOR SOIL CRACK DEVELOPMENT MECHANISMS



ADVANCED MICROCT SCANNER SHOWING THE PORE STRUCTURE OF SOIL



Dr. Jazaei's Team Investigating Impacts of Microplastic on Soil Hydrology





What Students Can Learn by Joining Dr. Jazaei's Team:

- **Microplastic Pollution Research:** Gain hands-on experience in studying the sources, movement, and impacts of microplastics in air, water, and soil systems.
- **Fieldwork and Data Collection:** Participate in environmental sampling, such as rainfall runoff and infiltration studies, to understand real-world pollution pathways.
- **Lab Analysis Techniques:** Learn advanced laboratory methods to identify and quantify microplastics in various environmental samples.
- **Environmental Modeling:** Use simulation tools to model how microplastics are transported in urban environments and predict pollution trends.
- **Sustainability Solutions:** Contribute to developing innovative strategies for mitigating plastic pollution and its impact on ecosystems.
- **Interdisciplinary Collaboration:** Work with experts in environmental science, engineering, and policy to tackle global pollution challenges.
- **Professional Development:** Build research skills, enhance critical thinking, and gain experience that prepares students for careers in environmental science and sustainability.



Join Dr. Jazaei's lab!

Earn academic credit, and maybe even get paid!

Should you have any questions don't
hesitate to contact Dr. Jazaei at
fjazaei@Memphis.edu

