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MICROFIBERS AND MICROPLASTICS IN WATER:
DEMONSTRATION OF SIMPLE WATER SAMPLING AND DETECTION OF MICROFIBERS AND MICROPLASTICS

MARK JONES
CREATIVE DIRECTOR
MJPHD, LLC

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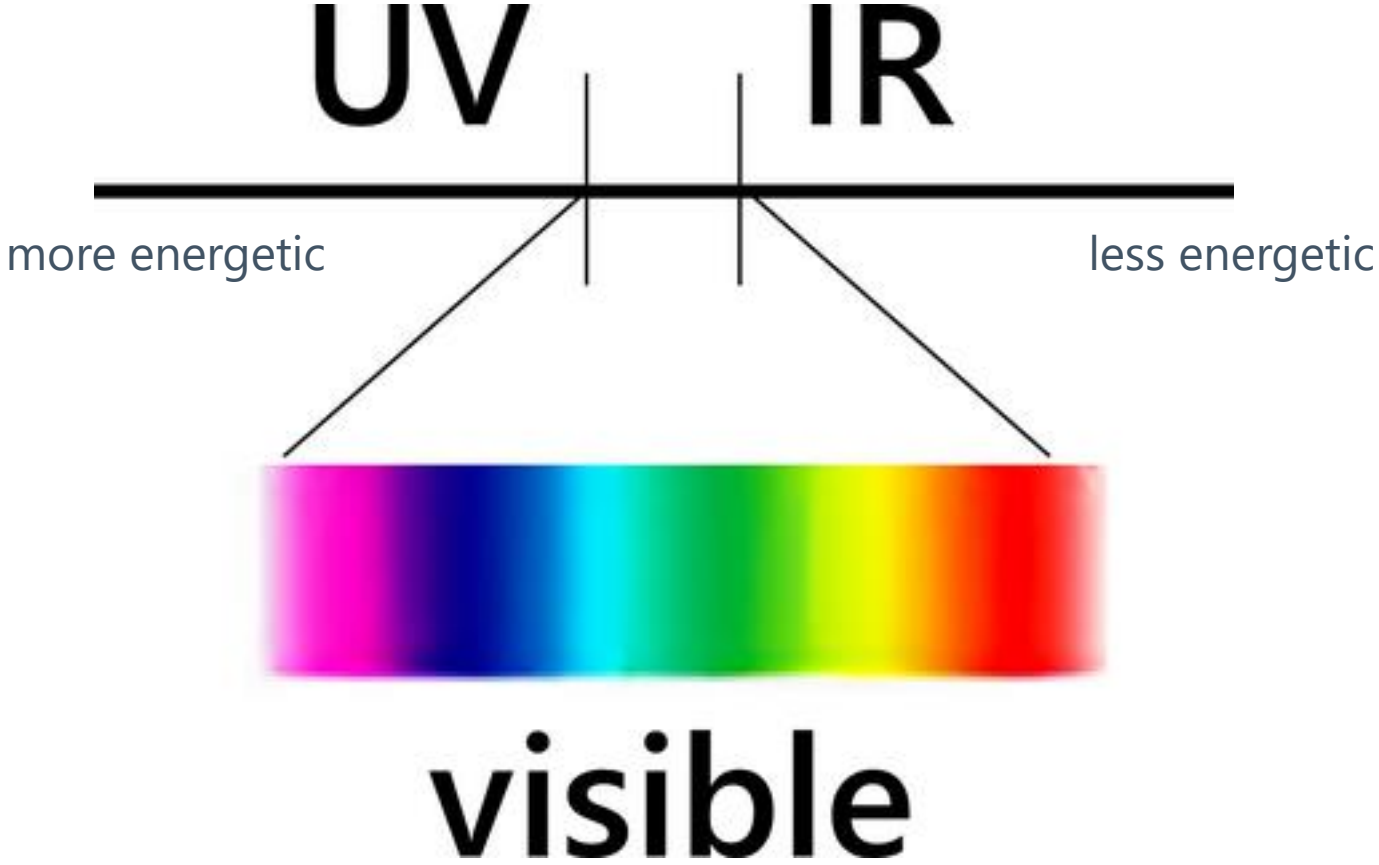
SCIENCE RENDEZVOUS

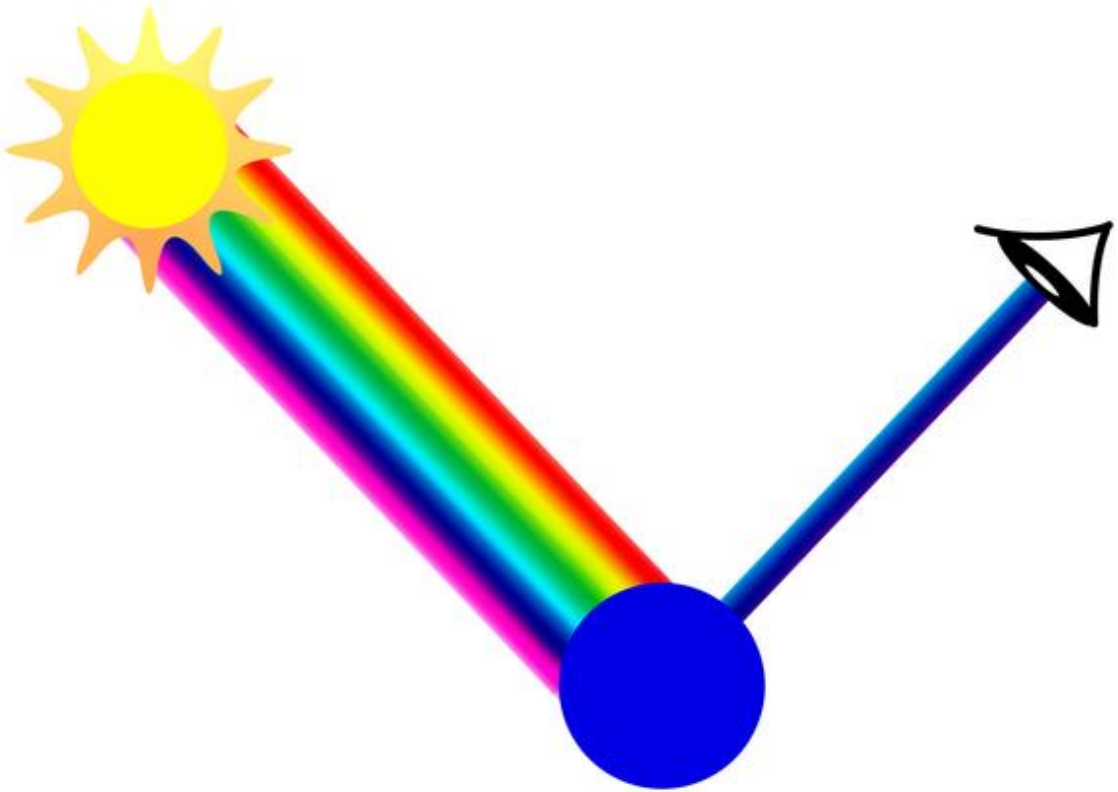
Microfibers and Microplastics in Water: How Searching for Yooper Lights Got Me Looking At Water in Different Ways

Abstract: A type of Canadian granite is especially flashy when illuminated with UV light. Commonly called Yooper lights, hunting them has become a sport on the shores of Lake Superior. The world looks very different under UV light. Things that escape notice during the day jump out at night under UV light. Yooper light hunting got me looking more closely at the water and the sand. Man-made microfibers and microplastics are revealed with a UV light and a microscope. Looking through different eyes allows seeing contamination that normally goes unnoticed.


UV light
(365 nm filtered)

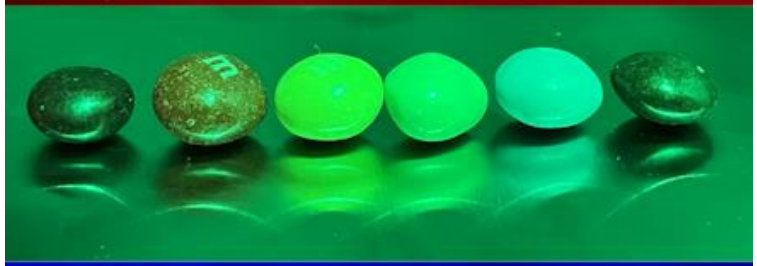

UV
IR
more energetic
less energetic
visible

Normal Vision and Colors

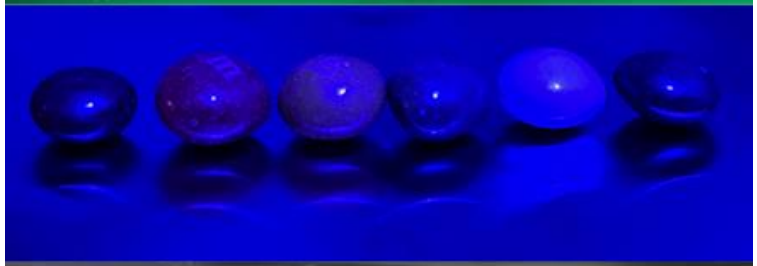


red light

green light

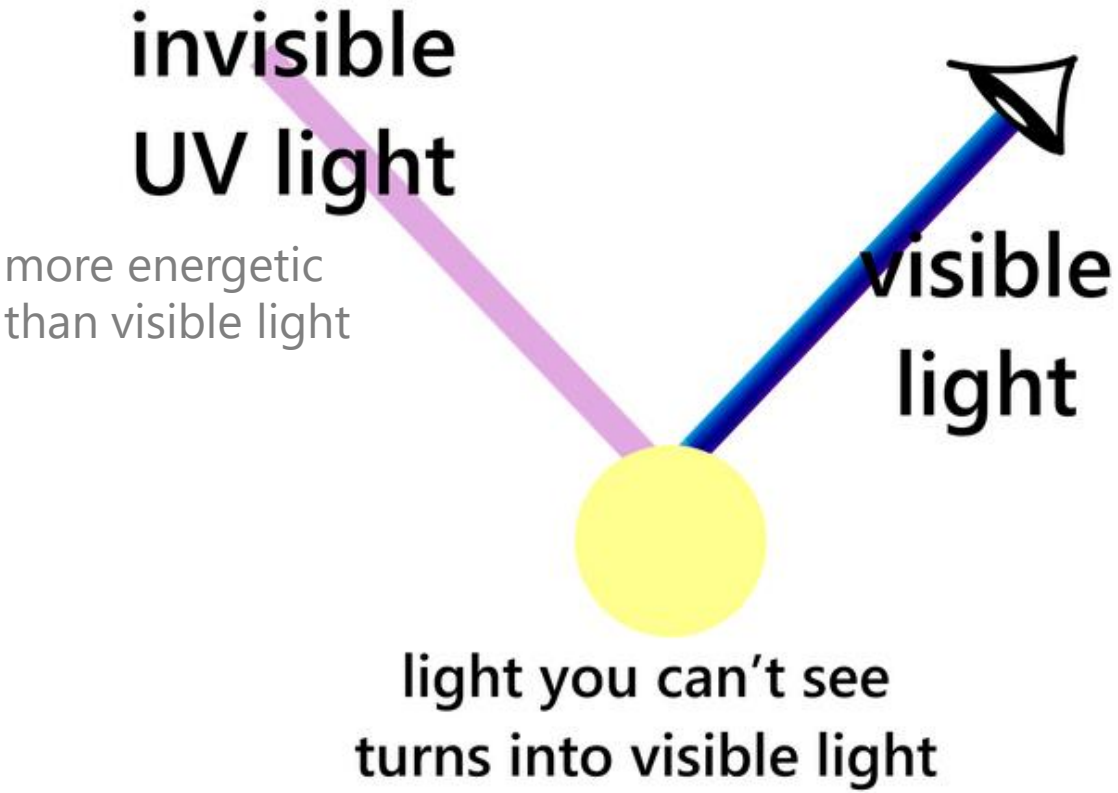


blue light



white light

FLUORESCENCE

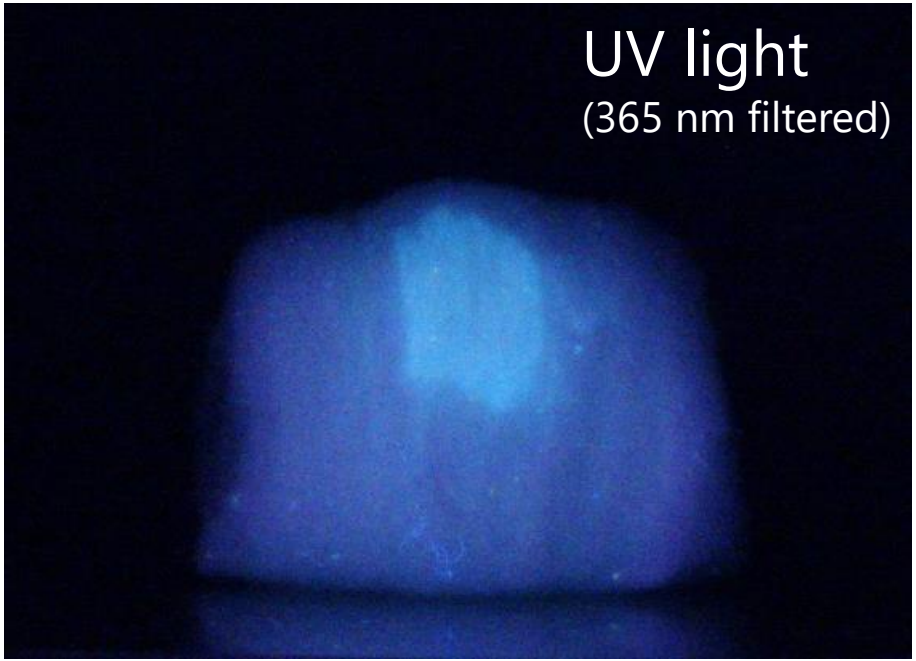


UV

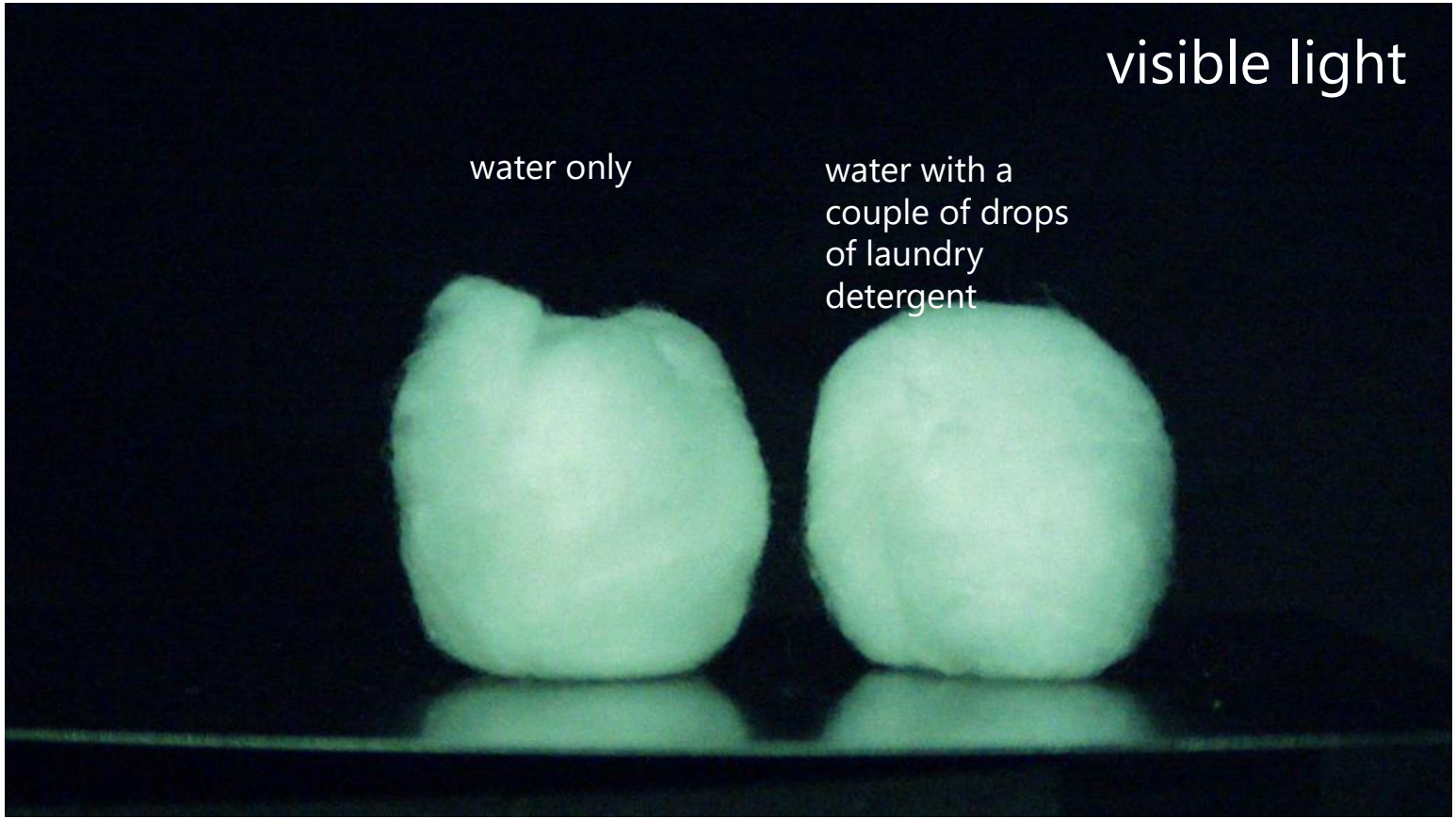
white light


visible light
filter

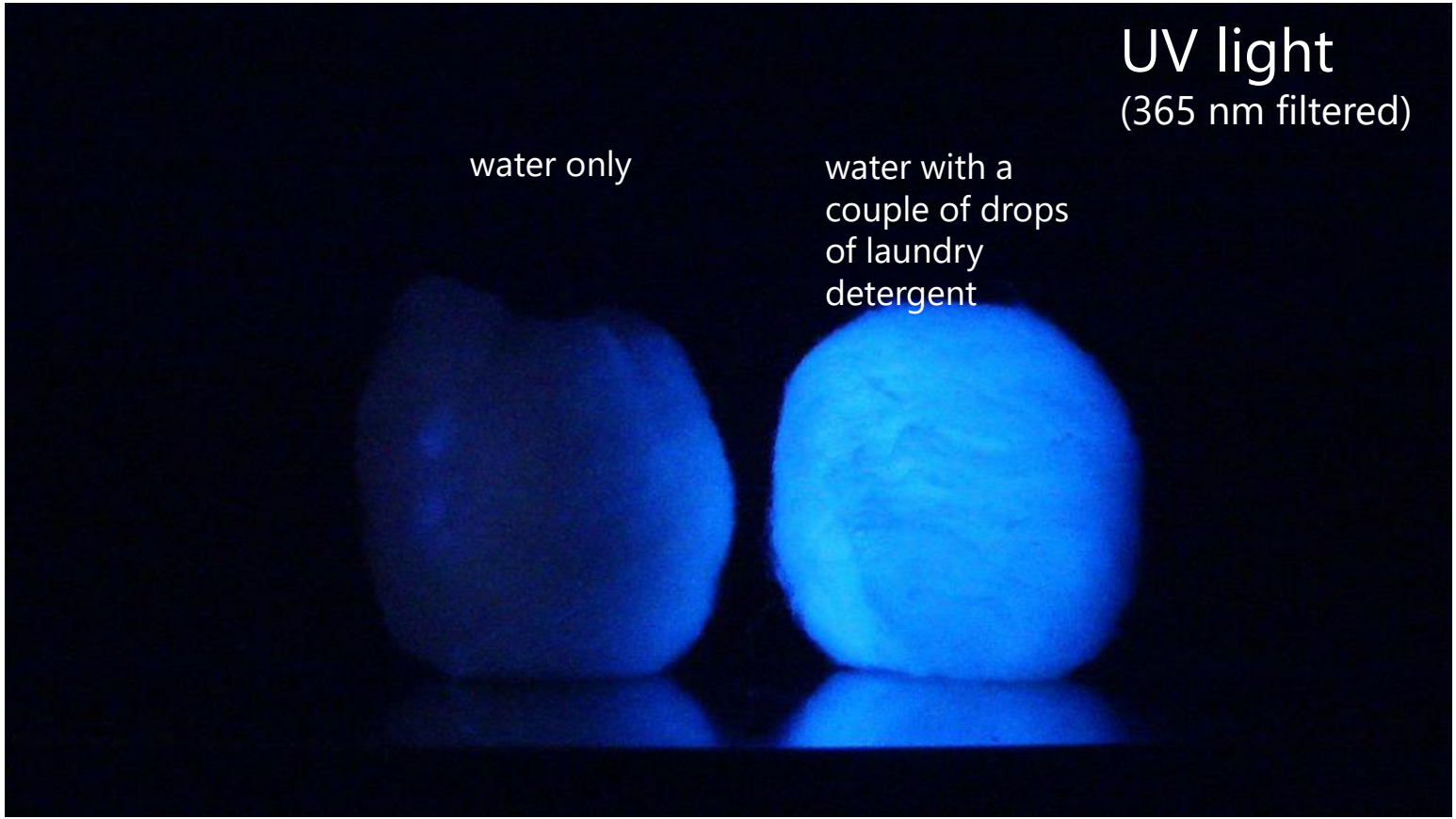

UV light
(365 nm filtered)


UV light
(365 nm filtered)

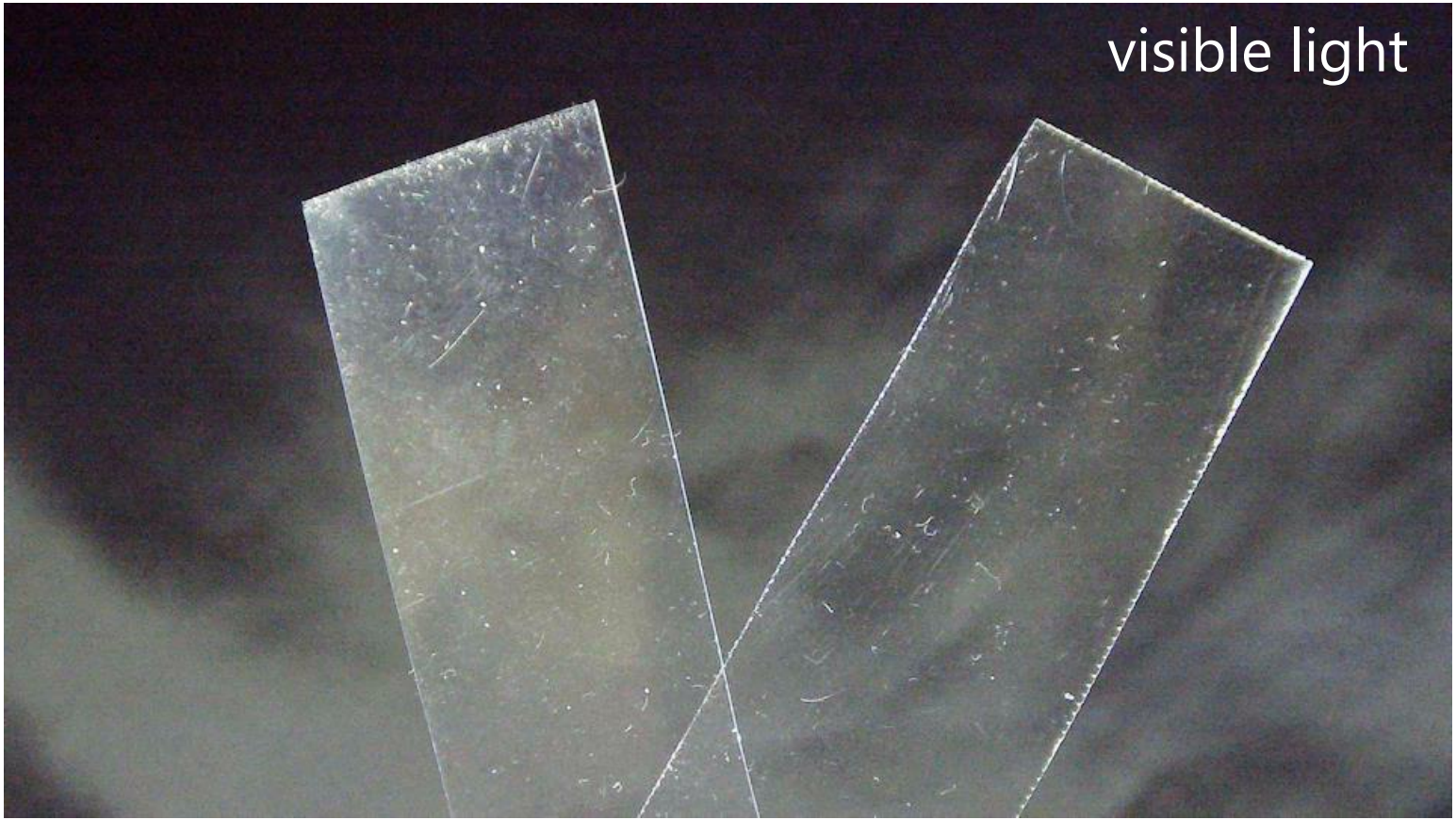
Optical Brighteners



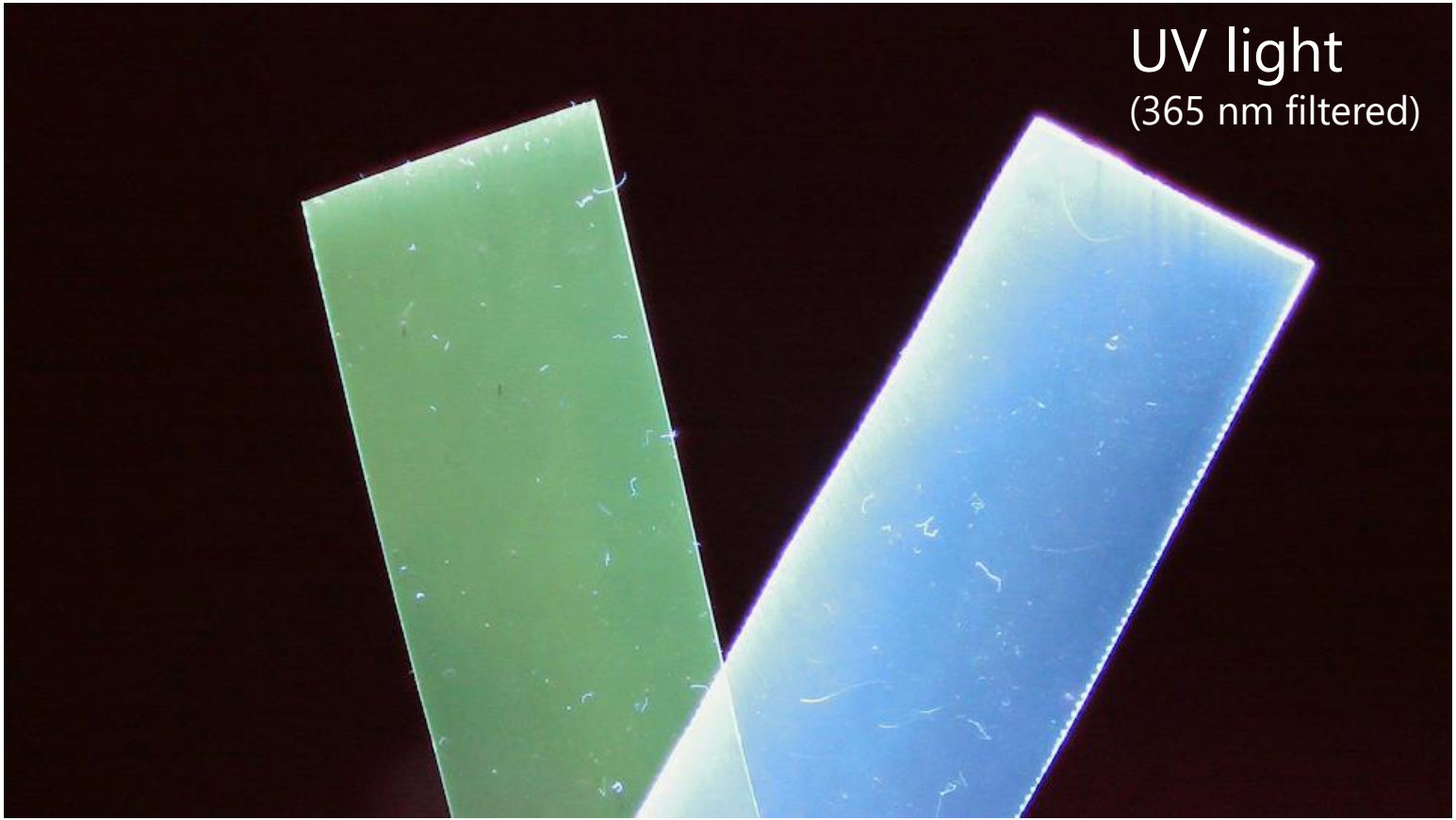
Optical Brighteners



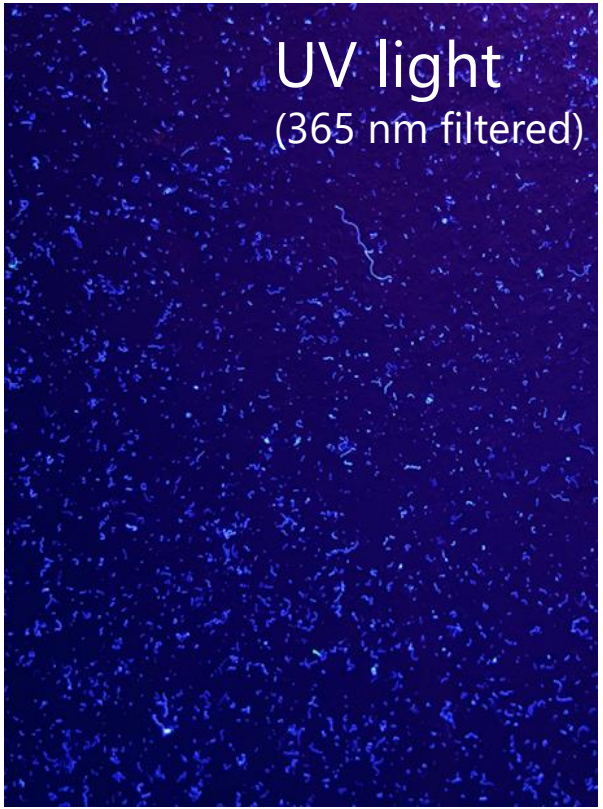
PET



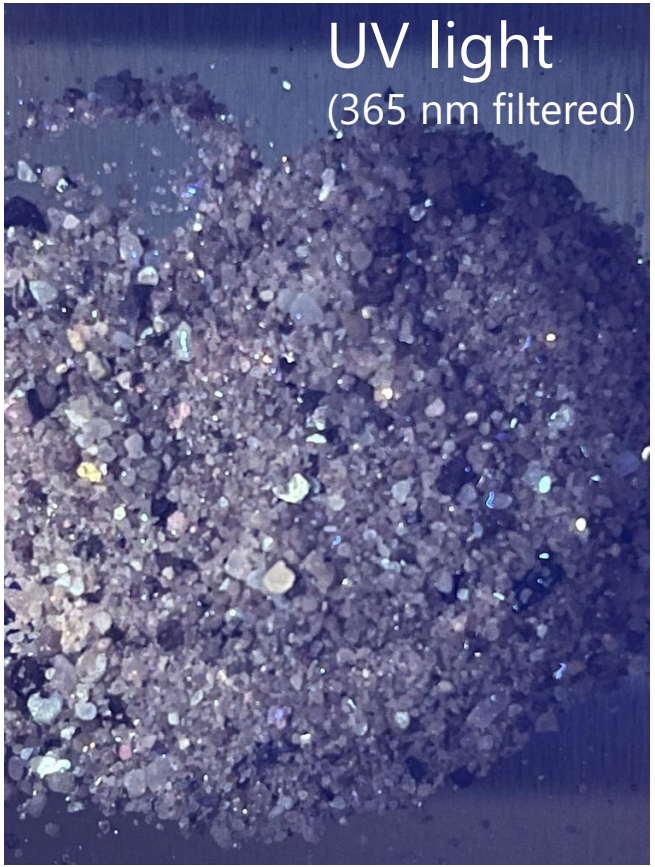
PET



T-SHIRT FIBERS – FIBERS ARE EVERYWHERE




visible light


UV light
(365 nm filtered)


LED
UV light
filter

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Review

Microplastics in freshwaters and drinking water: Critical review and assessment of data quality

Albert A. Koelmans [a, *], Nur Hazimah Mohamed Nor [a], Enya Hermsen [a], Merel Kooi [a], Svenja M. Mintenig [b, c], Jennifer De France [d, **]

[a] Aquatic Ecology and Water Quality Management Group, Wageningen University, the Netherlands
[b] KWR Watercycle Research Institute, the Netherlands
[c] Water Management, Delft University of Technology, the Netherlands
[d] World Health Organization, Geneva, Switzerland

high quality data is difficult!

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ABSTRACT

Microplastics have recently been detected in drinking water as well as in drinking water sources. This presence has triggered discussions on possible implications for human health. However, there have been questions regarding the quality of these occurrence studies since there are no standard sampling, extraction and identification methods for microplastics. Accordingly, we assessed the quality of fifty studies researching microplastics in drinking water and in its major freshwater sources. This includes an assessment of microplastic occurrence data from river and lake water, groundwater, tap water and bottled drinking water. Studies of occurrence in wastewater were also reviewed. We review and propose best practices to sample, extract and detect microplastics and provide a quantitative quality assessment of studies reporting microplastic concentrations. Further, we summarize the findings related to microplastic concentrations, polymer types and particle shapes. Microplastics are frequently present in freshwaters and drinking water, and number concentrations spanned ten orders of magnitude (1×10^{-2} to 10^{8} #/m^3) across individual samples and water types. However, only four out of 50 studies received

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Get a sample of water.

Filter out the small particles.

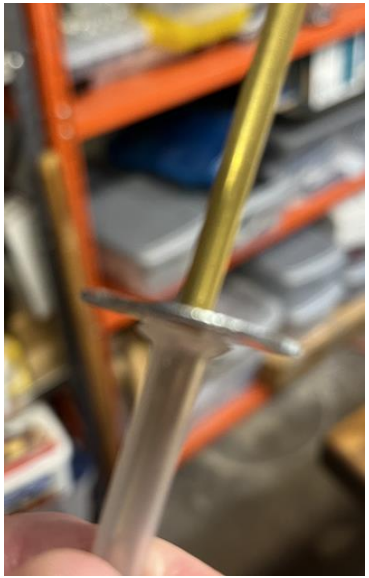
Count the particles.

current iteration designed to sample near but not at the surface

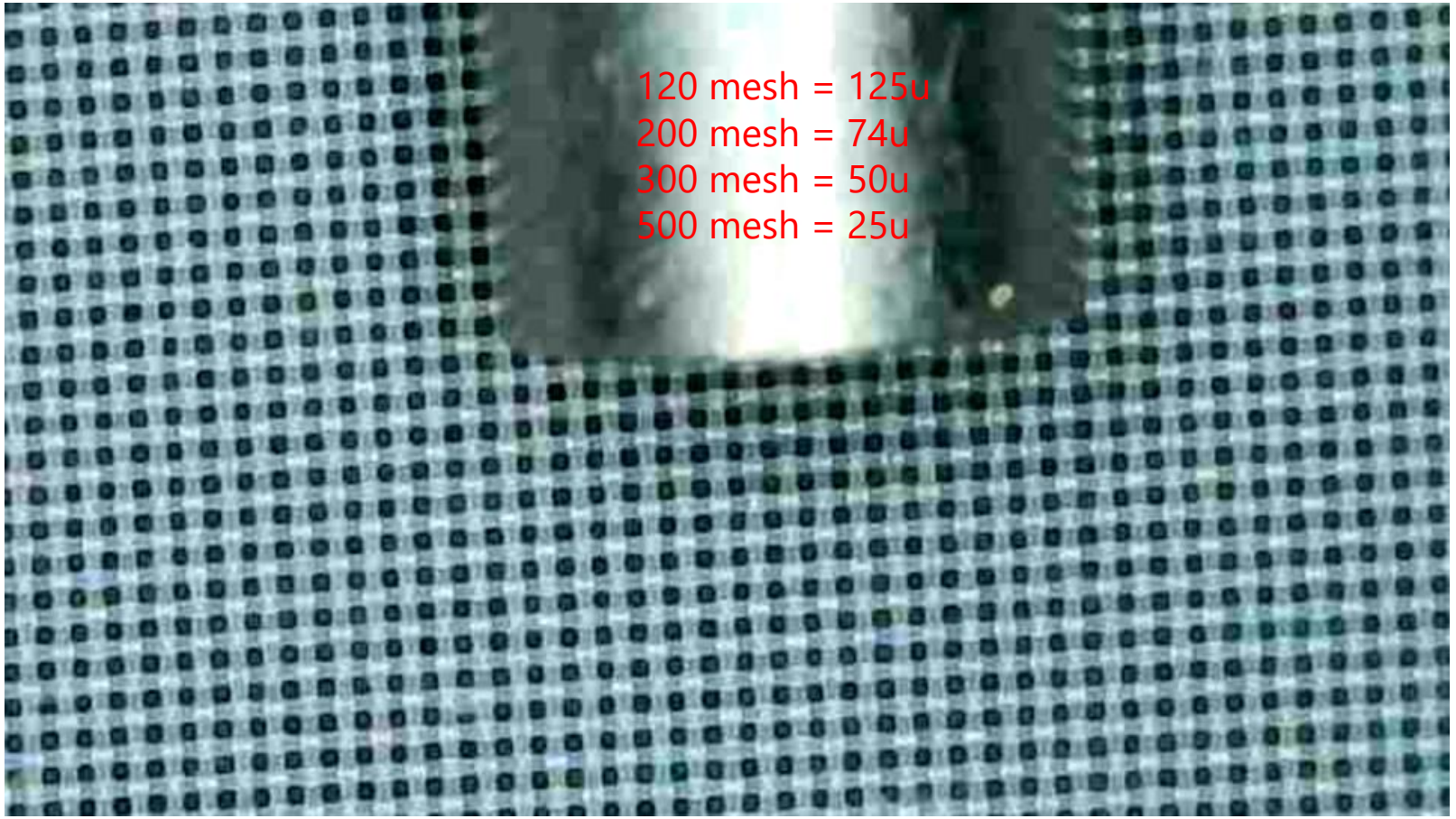
various options for filters explored

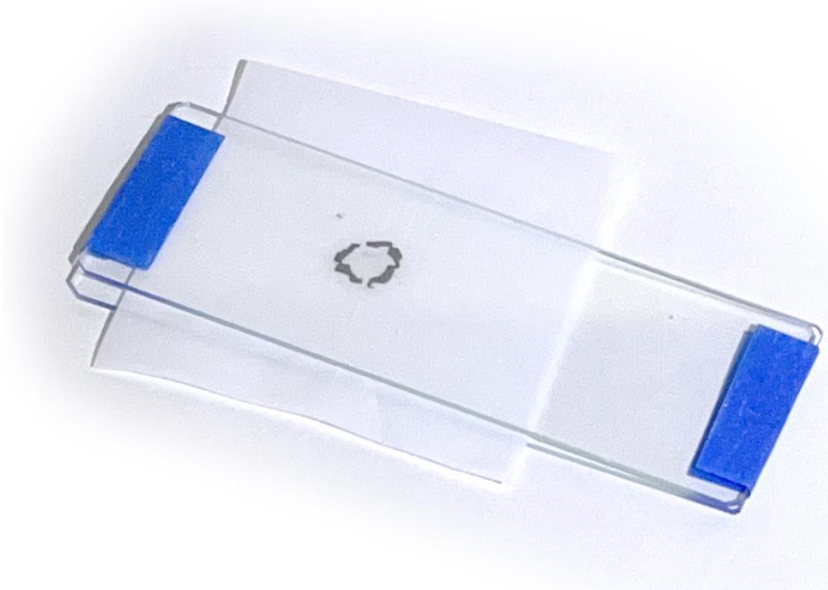
current iteration designed to filter at microscope resolution






Silk Screen Fabric as Filters



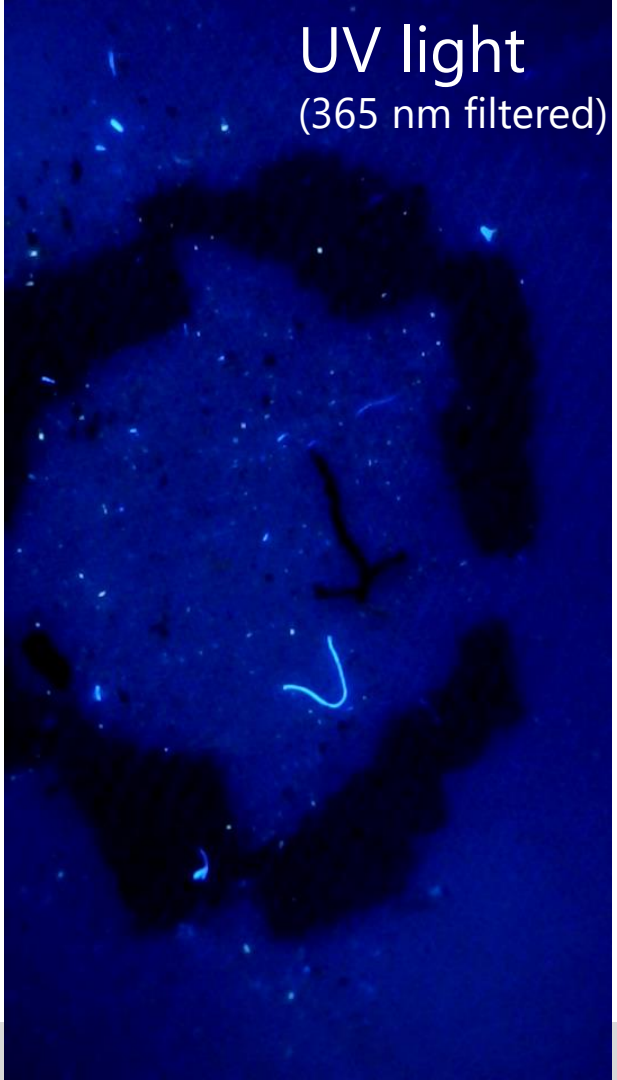


slide sandwich showing traced outline of funnel on filter media

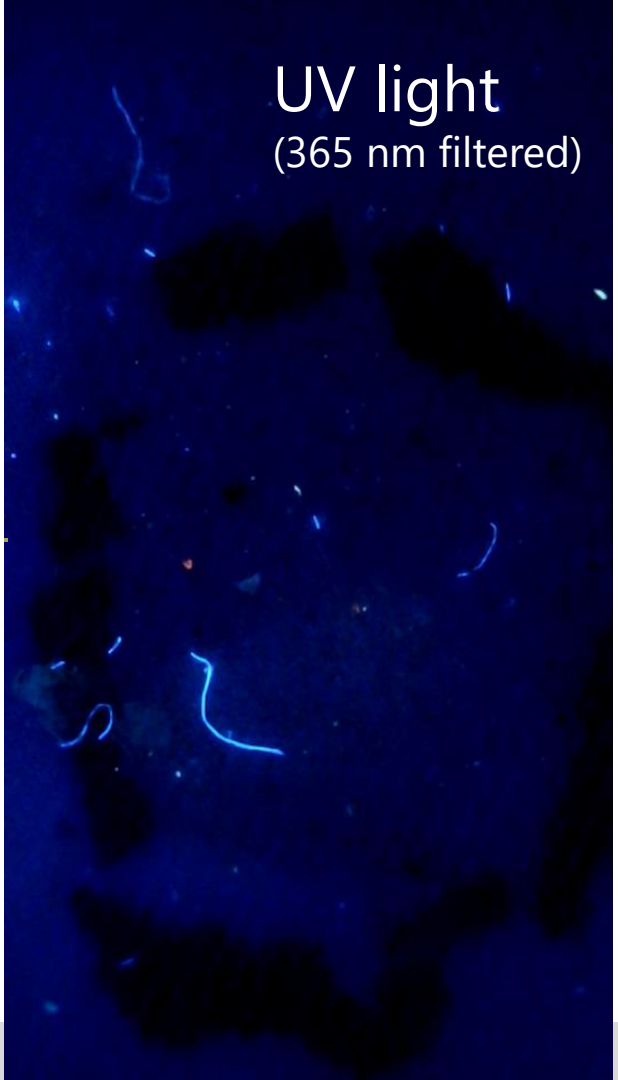
Sampling Steps

- Use masking tape to make microscope slide sandwich leaving one side open
- Open slide sandwich
- Rinse funnel with sample
- Dry tip
- Pull filter mesh around tip
- Outline funnel tip on filter fabric with marker
- Push retainer over fabric snuggly ensuring outline doesn’t move
- Pass 100 mL of water through funnel
- If filtering slows or doesn’t flow, use syringe to pressurize
- Carefully remove retainer
- Place on filter paper to dry
- Put in on slide and close the sandwich


visible light


UV light
(365 nm filtered)


visible light


UV light
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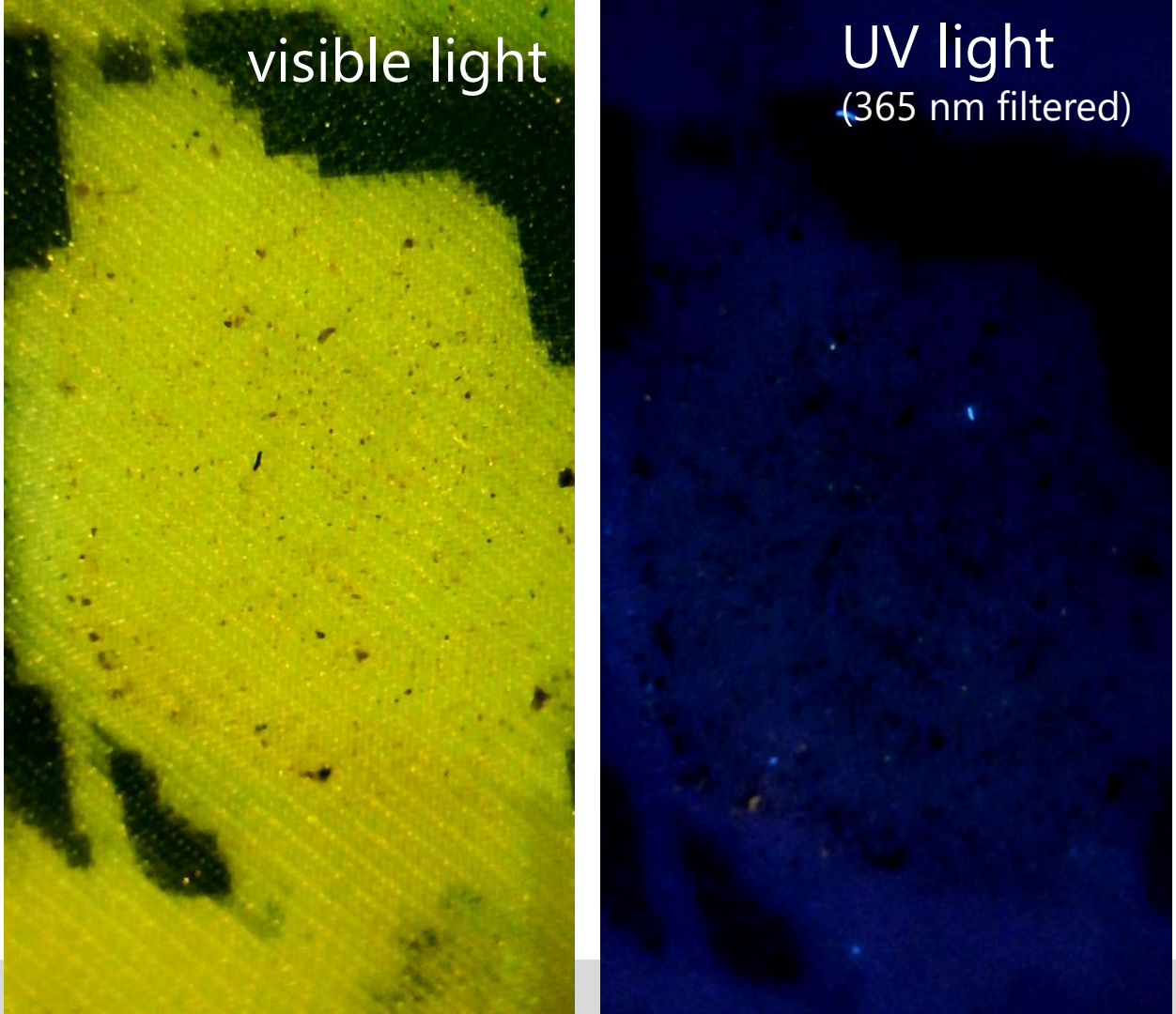

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Thanks to Henry Lecaptain for 3D printing the filter holder.

Water Chemistry in the Great Lakes Region

www.cmich.edu/academics/colleges/college-science-engineering/centers/cmu-biological-station/h2o-q-in-the-classroom

Flaws

- Speed at the expense of perfect accuracy
- Sampling challenges can dramatically shift results
- Fluorescence emphasizes some materials while ignoring others

Finding new ways to look at the world can yield interesting results.

Plastic particles are everywhere.

Sampling may help identify areas where something can be done.

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