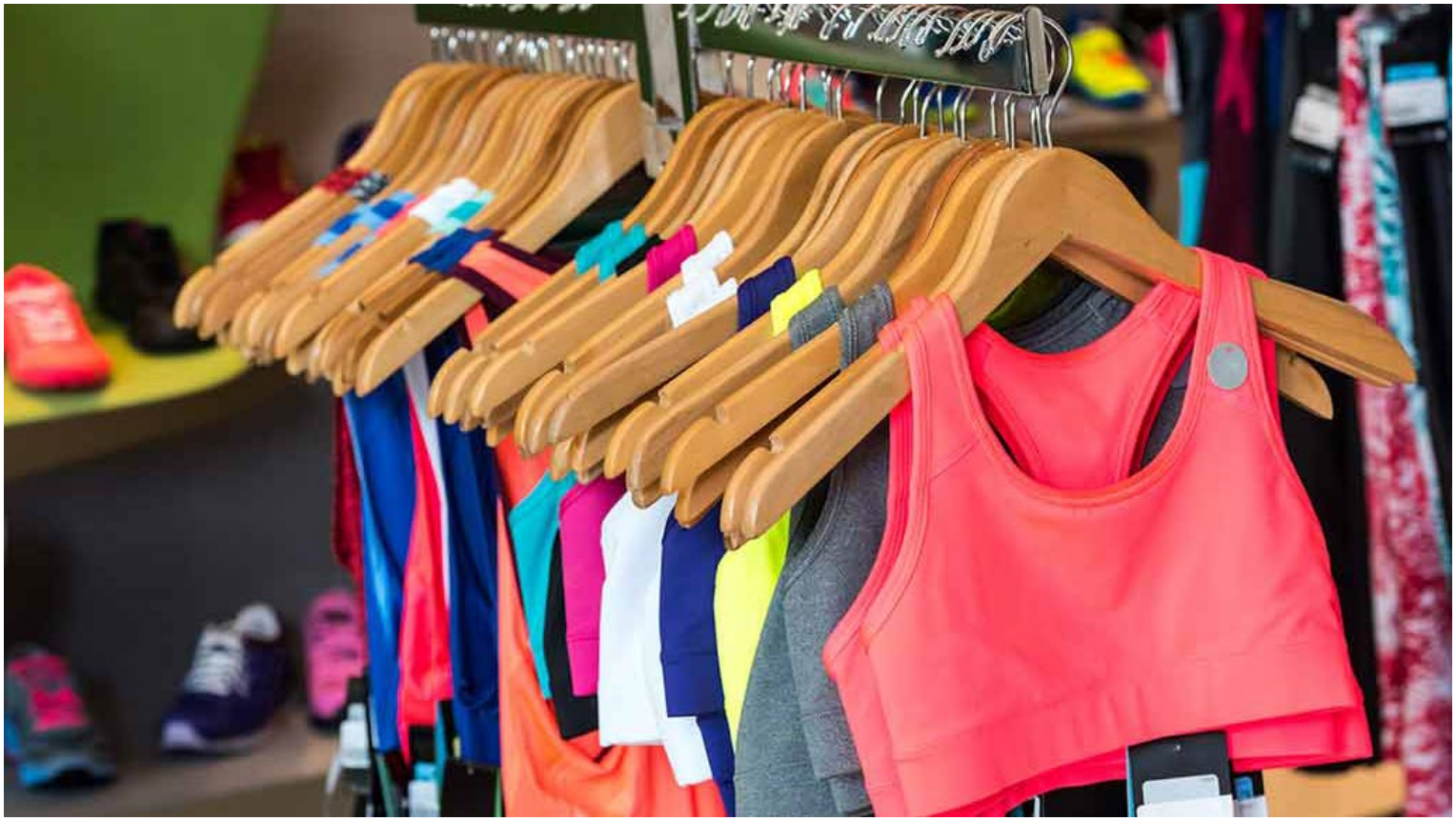
ENVIRONMENT

Why today's 'fast fashions' can be bad for the planet

The constant buy-wear-toss cycle of such clothes also costs more in the long run



So-called "fast fashion" has made clothes affordable enough that young people can buy far more clothes than are needed. And the relatively low cost of these items also makes people likely to trash clothes when they no longer seem fashionable or may be in need of repairs.

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By Kathiann Kowalski

December 10, 2020 at 6:30 am

If you're like many teens, you probably spend a big chunk of your money on clothes. But when the COVID-19 pandemic hit this year, clothing sales fell. Now holiday sales might tempt you with deals on the latest styles. Yet many of those bargains have hidden costs for the environment — and your wallet.

"Fast fashion" refers to how the clothing industry churns out lots of relatively cheap garments and gets them to stores every few weeks. The practice lets shoppers buy new styles all the time. And garment prices are relatively low. But many of those clothes quickly wear out or go out of style. Their price tags also don't include all of the clothes' environmental costs.

Those impacts start when fibers for fabrics are grown or produced in factories. Pollution continues to build as clothes are fashioned from those fibers, taken to market and later laundered by users. Even tossing out those garments at the end of their useful lives has costs to the environment.

When most teens look at their clothes, they see only the style, colors and textures. Few consider the environmental costs, including pollution, associated with making those clothes and getting them into their closets.

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The problem starts with how we think about fashion, says Kirsi Niinimäki. She's a fashion, textile and design researcher at Aalto University in Espoo, Finland. "Everyone nowadays owns too many garments. And we use them a really short time and then dispose of them," she says. Even if something stays in your closet for years, you might only wear it some 40 times.

She was part of a team that looked at many studies on environmental costs of the fashion industry. That industry accounts for 8 to 10 percent of global emissions of carbon dioxide, a greenhouse gas, they found. The business also is responsible for about one-fifth of industrial water pollution. Just over a third of the tiny bits of plastic, called microplastics, found in oceans come from clothing. And people produce more than 92 million metric tons (101.4 million U.S. tons) of textile and clothing waste each year, the team found. Its report appeared in the April issue of *Nature Reviews*.

Fashion is a global industry, as Pietra Rivoli learned. She's an economist at Georgetown University in Washington, D.C. Rivoli bought a cotton T-shirt in Florida. The tag said it was made in China. But, she learned, the factory got most of its cotton from Texas. And used or unwanted T-shirts often wound up in Africa. There, people sold them for reuse. She wrote about her findings in *The Travels of a T-Shirt in the Global Economy.* The book first came out in 2005. Since then, the African market for used tees has shrunk. More developing countries want their own clothing industries to grow. So more old T-shirts will simply be trashed.

Old clothes soon may be recycled, not trashed

The journey of your own clothes from fiber to finished product comes with environmental costs. Scientists and engineers have been working on ways to curb some of these impacts. They range from limiting pollution to looking for ways to ultimately recycle the raw materials that go into our clothes.

Material matters

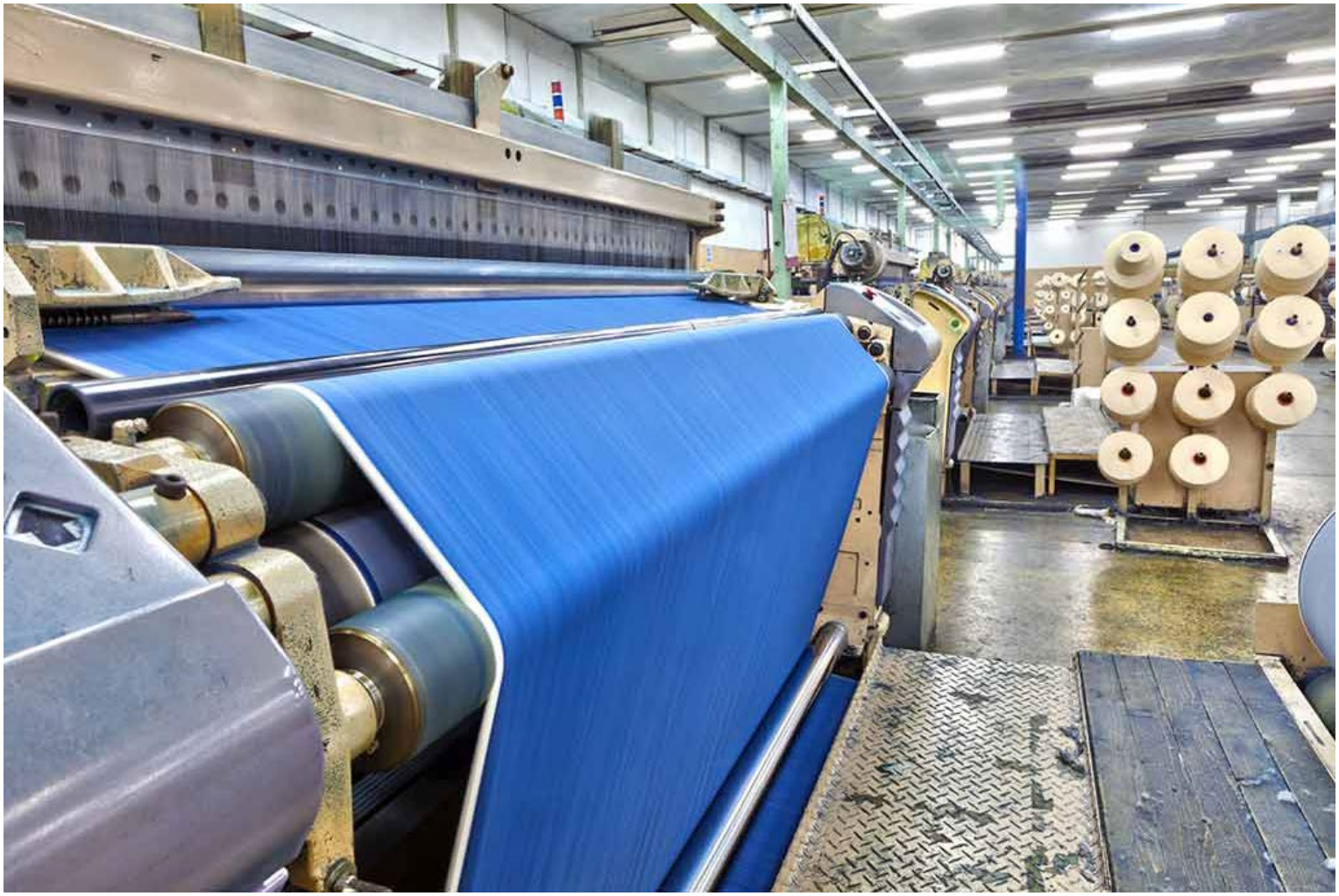
There's no ideal material for clothes, Niinimäki says. All fabrics affect the environment. They just do it in different ways.

It starts with the raw materials. Think about a cotton T-shirt, for example. Making it takes about 2,720 liters (719 gallons) of water. For comparison, people need at least 30 liters (almost eight gallons) of water per day for drinking, cooking and washing. That's according to the World Health Organization. Add in cleaning, sanitation, waste disposal, farming and more, and the average need rises to 50 to 100 liters (13 to 26 gallons) of water daily. At that rate, the water for each tee could support someone for a month or two.

Wool comes from sheep or other animals. Sheep grazing can lower an area's biodiversity. That's the number and variety of species in a region. Where raising livestock for fibers is not sustainable, soil erosion and loss of habitats may occur.

Polyester fabrics are made of plastic fibers produced from petroleum. Drilling for fossil fuels and making the plastics releases greenhouse gases and other pollution.

Next, these fibers are made into fabrics. Manufacturing uses many chemicals. Some of them clean fibers. Others make them less likely to stain or wrinkle. Still more chemicals give fabrics a certain look or feel. Dyes then color the fabrics. All of these chemicals can pollute the environment. Some can be quite toxic.



Dyed yarns are woven into denim on an air jet loom.

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Companies generally care more about what chemicals do than what those chemicals are. So if researchers can identify less-harmful chemicals that still work well, companies might switch, notes Sandra Roos. She's an environmental scientist at RISE, the Research Institutes of Sweden in Göteborg.

Roos and other scientists looked at what chemicals that are used by the textile industry do. Then they used that information to create a database. It offers guidance and a checklist on their features for Scandinavia's industry. The group wants companies to know more about the risks and impacts of chemicals over the life of a textile. Ideally, companies would then choose chemicals with less harmful impacts.

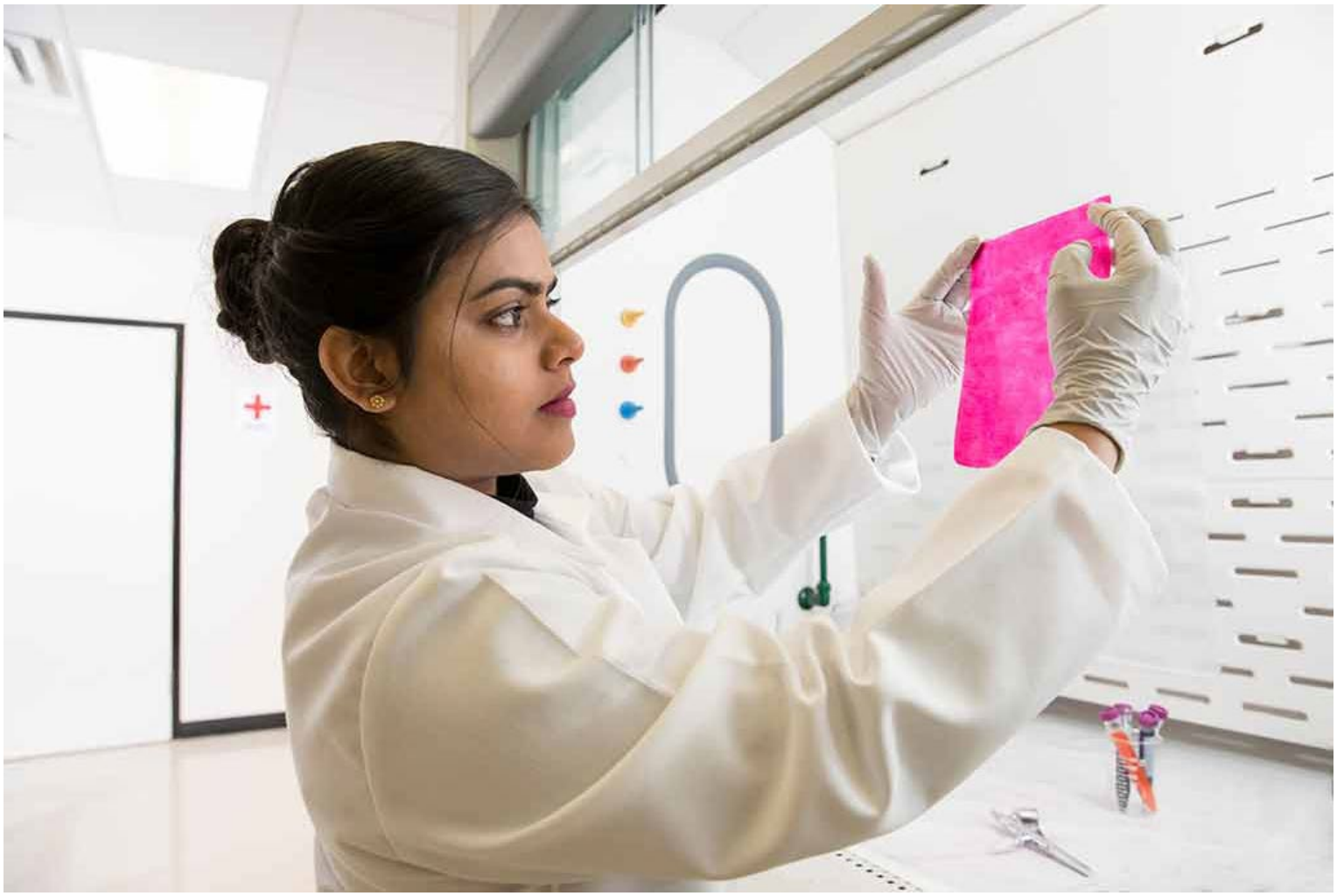
The group thinks the approach could work in other countries, too. Databases would need to be updated, though. And funding could be a challenge. The team described its findings in the February issue of *Sustainability*.

Dyeing for a change

Another approach is to make the processes the textile industry uses friendlier to the environment.

Most cotton is colored with dye baths. Companies "dissolve a dye, and then they dump all the fabric [in it]," says Anuradhi Liyanapathiranage. She's a graduate student at the University of Georgia in Athens. Rinsing removes dye that didn't bond to the fabric. Baths with more chemicals help fix, or set, the dye. "To dye one kilogram of cotton, it takes more than 100 liters of water," she says. (That's more than 26 gallons for each 2.2 pounds of fabric.)

Her research team came up with a new method. Instead of putting dye in a bath, it puts the dye in a gel along with tiny bits of cellulose. The texture is "something like Jell-O," she explains. The cellulose comes from wood fiber. You'd need a microscope to see each tiny bit. But those bits have lots of surface area, so lots of dye bonds to them.



Anuradhi Liyanapathiranage and a team at the University of Georgia in Athens have developed a way to dye fabric that uses less water and toxic chemicals than standard methods.

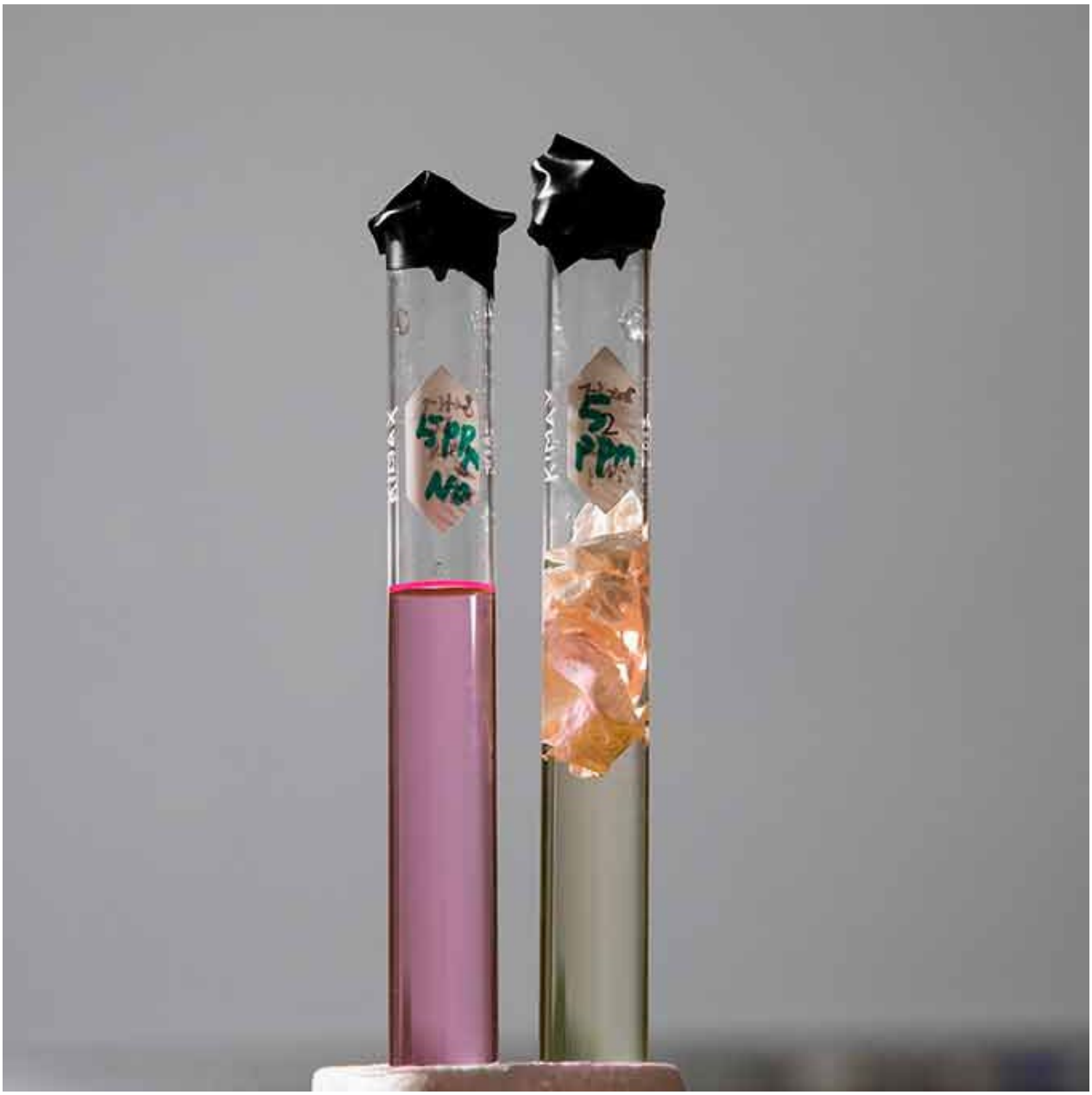
NANCY EVELYN/UNIV. OF GEORGIA

The gel goes onto the fabric as if it were an ink or paint. In all, the new method cuts water use by about 90

percent. And the team showed that the method works with a range of dye colors. Its report came out April 17 in the journal *ACS Omega*.

Companies also have to dispose of leftover dye. Some dyes are toxic. And even a little dye can color a lot of water. That pollution might block sunlight from reaching species that need it, explains Anthony Dichiara. He's a materials scientist at the University of Washington in Seattle. A sponge that his group developed absorbs those dyes. It has bits of cellulose from wood pulp, plus bits of palladium, a metal. The metal speeds up a chemical reaction that turns blue dye colorless. The sponge can then be squeezed out and reused.

The altered dye molecules are still in the water. But, Dichiara points out, "in some cases the colorless form would be less toxic." The group reported its success two years ago.



The tube on the left shows a red dye solution. In the tube on the right, the dye was trapped by a reusable web invented by a team at Texas Tech University. Light can then break down the dye.

TEXAS TECH UNIVERSITY

Another group invented a reusable filter to catch and break up synthetic dyes. Seshadri Ramkumar is a materials scientist at Texas Tech University in Lubbock. He and his team made this filter from a web of nanofibers. A water-repelling compound keeps the web from absorbing water. Meanwhile, the web traps larger dye molecules in its small pores. After the filter dries, a titanium-dioxide compound in it helps visible light break down the dye.

Sunlight activates the dye breakdown, notes Ramkumar. His group has tested the filter with a red dye. After six hours, eight in every 10 of the dye molecules had broken down. The rest broke down over the course of seven weeks. (Over time, dye colors can fade in visible light, but not that quickly.)

Using sunlight helps keep the dye-breakdown costs low. That matters in a competitive industry like fashion, Ramkumar says. "There needs to be a balance between technology and cost."

He and his team just described their new filter in the October issue of the *Journal of Environmental Chemical Engineering*.

Manufacturing fabrics is one step. Making them into clothes is the next. Factory processes aim to minimize unused fabric. But there will be some wastes. And these still have to go somewhere.

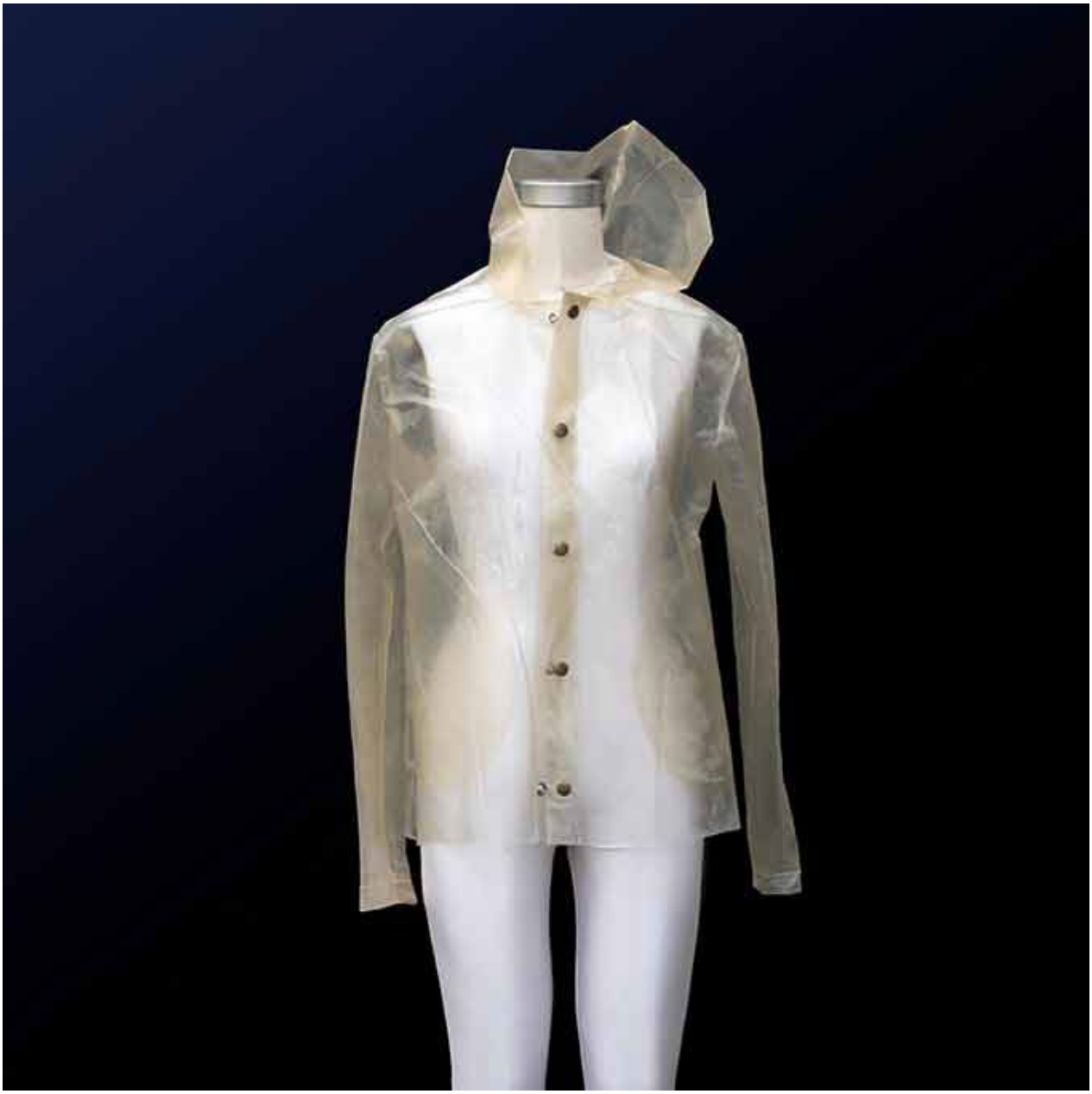
Manufacturing also uses energy. Those processes can release greenhouse gases. Then finished clothes will move to market. This stage usually uses more fossil fuels.

Environmental impacts continue as we wear our clothes. Washing and drying laundry removes little bits of lint and dye from fabrics. Very tiny fibers from polyester fabrics are a type of microplastic. They pollute both water and air. All-cotton fabrics tend to release even more fibers than polyesters, British researchers have shown. Washing clothes in cooler water and for a shorter time can help, they suggest in the June *Dyes and Pigments*.

The future of fashion

Charlotte McCurdy is a designer at NEW INC in New York City. Her work spans multiple fields, including industrial design. One of her recent designs was a raincoat made from algae. She created the see-through coat to highlight the fashion industry's impact on climate. Typical plastics in clothing emit greenhouse gases, she notes. Algae, on the other hand, can absorb carbon dioxide as they grow.

McCurdy doesn't plan to mass-produce the coat. Instead, she's been working on another project with fashion designer Phillip Lim. They're designing a carbon-neutral dress. That means making it won't add to greenhouse gases in the atmosphere. The dress will look stylish, but "it won't be alien," she adds, as in weird. After all, she explains, "you don't want to feel like you're wearing Saran® wrap."



Designer Charlotte McCurdy made this raincoat with an algae-based fabric. Her design draws attention to the need to move away from fashions that add to the problem of climate change.

COURTESY OF CHARLOTTE MCCURDY

The bigger question is what society does beyond fashion exhibits. The answer isn't just to go back to living off home-grown materials, such as cotton, McCurdy says. That wouldn't provide enough for everyone, especially in developing nations. Nor can most people afford handmade clothes from fabrics like the algae-based material — at least not yet. "We need these technologies to be affordable if we want to actually make

a difference," she says.

"Maybe we could talk about repairability and end of life" before buying clothes, suggests

Joanne Brasch. In other words: "What are you going to do with it when you're done with it?" Brasch is a textile scientist with the California Product Stewardship Council in Sacramento.

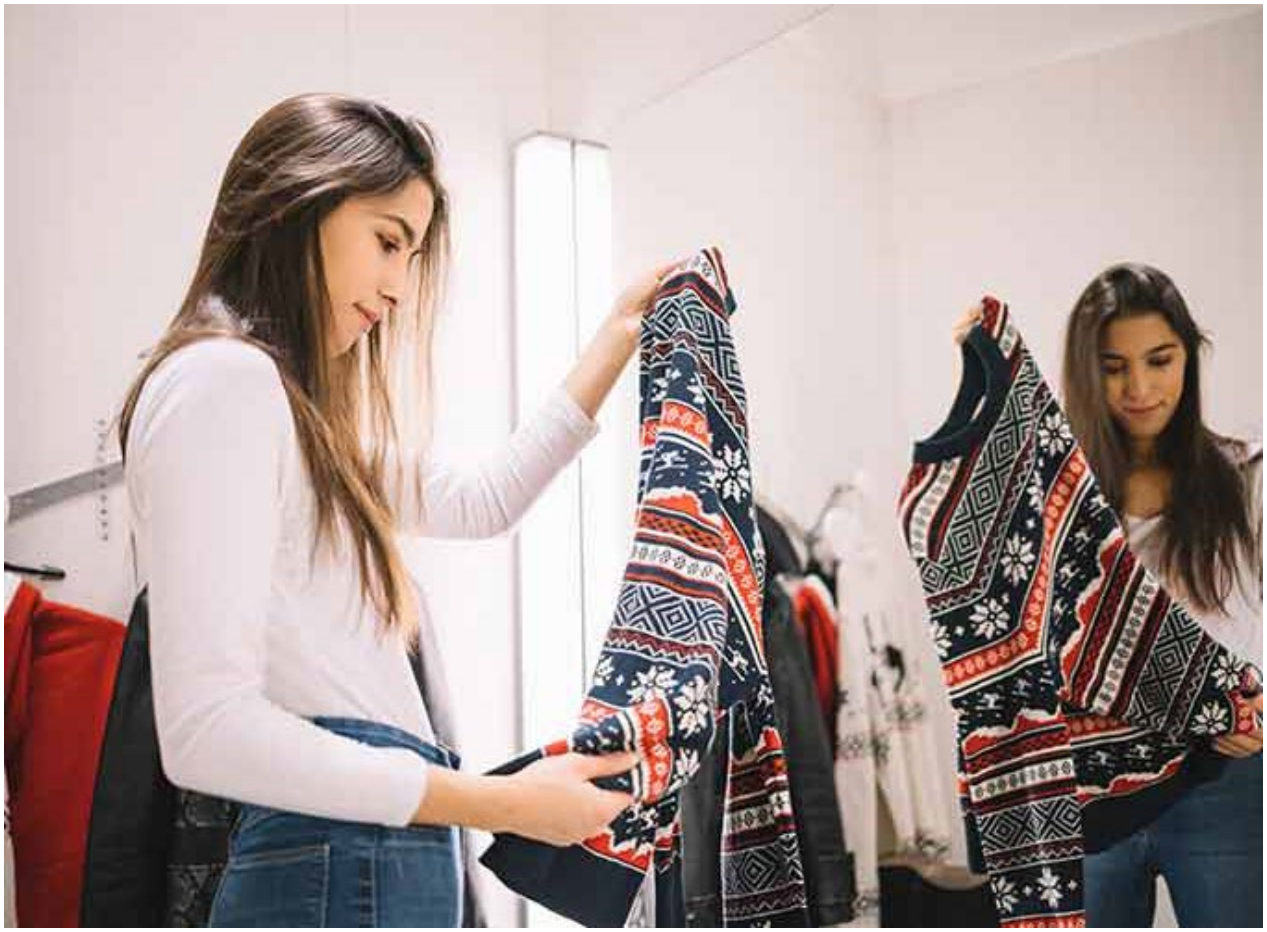
"I also call myself a trash doctor," she jokes. And in that context, her focus is on healing. More and more people are learning basic sewing skills, she notes. They fix rips and sew buttons to restore ailing clothes.

Many people also are learning how to restyle clothes that have gone out of fashion. "It's really popular right now to do artistic mending," Brasch says.

Secondhand shops and clothing swaps are other options. Donation programs can also get clothes to people who can use them. (Note that most charities want in-season clothes that their clients can wear right away.)

Not all ways to reuse clothing are equal. And textiles need to be reused long enough to offset the environmental costs of moving them from place to place. A team in Australia and Sweden reported this two years ago in the *Journal of Cleaner Production*.

Think about these things when you shop for new clothes, Brasch says. If you're buying something in person, feel the fabric. If it feels flimsy, it probably won't wear well. Read the label, too. Organic fabrics with low-impact dyes generally use fewer harmful chemicals, she says. Some may claim to use recycled fabrics. But don't assume all recycled fabrics are good choices. Many of them won't be recycled again.



Think carefully before you buy new clothes, experts suggest. Will a garment last a long time? Will you wear it a lot? Do you really need it? Or are you buying to satisfy some emotional need?

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"I think it really comes back to buying the right clothes and the ones that are worth mending," she says. That means "building up your classics," such as plain jeans or plain black pants. They won't look as flashy as the latest fashions. But they won't go out of style, either.

"Businesses are really clever about using the allure of fast-fashion trends," warns Niinimäki at Aalto University. "We have to try to avoid too-trendy looks." Consumers should learn more about what they're buying — and why, she adds. Are we buying something new because we need it? Or, she asks, are we buying based on our emotions?

"We should really try to be a little bit more critical about our consumption practices and try to extend the life . . . of the product," Niinimäki says. Better-quality clothes may cost more at first. But they'll last longer and help us look our best.

And isn't that what we really want from fashion?

Power Words

More About Power Words

algae: Single-celled organisms, once considered plants (they aren't). As aquatic organisms, they grow in water. Like green plants, they depend on sunlight to make their food.

atmosphere: The envelope of gases surrounding Earth or another planet.

average: (in science) A term for the arithmetic mean, which is the sum of a group of numbers that is then divided by the size of the group.

biodiversity: (short for biological diversity) The number and variety of species found within a localized geographic region.

bond: (in chemistry) A semi-permanent attachment between atoms — or groups of atoms — in a molecule. It's formed by an attractive force between the participating atoms. Once bonded, the atoms will work as a unit. To separate the component atoms, energy must be supplied to the molecule as heat or some other type of radiation.

carbon: The chemical element having the atomic number 6. It is the physical basis of all life on Earth. Carbon exists freely as graphite and diamond. It is an important part of coal, limestone and petroleum, and is capable of self-bonding, chemically, to form an enormous number of chemically, biologically and commercially important molecules.

carbon dioxide: (or CO_2) A colorless, odorless gas produced by all animals when the oxygen they inhale reacts with the carbon-rich foods that they've eaten. Carbon dioxide also is released when organic matter burns (including fossil fuels like oil or gas). Carbon dioxide acts as a greenhouse gas, trapping heat in Earth's atmosphere. Plants convert carbon dioxide into oxygen during photosynthesis, the process they use to make their own food.

cellulose: A type of fiber found in plant cell walls. It is formed by chains of glucose molecules.

chemical: A substance formed from two or more atoms that unite (bond) in a fixed proportion and structure. For example, water is a chemical made when two hydrogen atoms bond to one oxygen atom. Its chemical formula is H_2O. Chemical also can be an adjective to describe properties of materials that are the result of various reactions between different compounds.

chemical engineer: A researcher who uses chemistry to solve problems related to the production of food, fuel, medicines and many other products.

chemical reaction: A process that involves the rearrangement of the molecules or structure of a substance, as opposed to a change in physical form (as from a solid to a gas).

climate change: Long-term, significant change in the climate of Earth. It can happen naturally or in response to human activities, including the burning of fossil fuels and clearing of forests.

consumer: (n.) Term for someone who buys something or uses something. (adj.) A person who uses goods and services that must be paid for.

COVID-19: A name given to the disease that caused a massive global outbreak. It first emerged in December 2019 and is caused by a new coronavirus known as SARS-CoV-2. Symptoms include pneumonia, fever, headaches, blood clots and trouble breathing.

database: An organized collection of related data.

development: (in biology) The growth of an organism from conception through adulthood, often undergoing changes

in chemistry, size and sometimes even shape. another so that it can be used for housing, agriculture, or resource development. (in engineering) The growth or change of something from an idea to a prototype.

dissolve: To turn a solid into a liquid and disperse it into that starting liquid. (For instance, sugar or salt crystals, which are solids, will dissolve into water. Now the crystals are gone and the solution is a fully dispersed mix of the liquid form of the sugar or salt in water.)

economy: Term for the combined wealth and resources (people, jobs, land, forests and minerals, for instance) of a nation or region. It is often measured in terms of jobs and income or in terms of the production and use of goods (such as products) and services (for instance, nursing or internet access).

engineer: A person who uses science to solve problems. As a verb, to engineer means to design a device, material or process that will solve some problem or unmet need. (v.) To perform these tasks, or the name for a person who performs such tasks.

environment: The sum of all of the things that exist around some organism or the process and the condition those things create. Environment may refer to the weather and ecosystem in which some animal lives, or, perhaps, the temperature and humidity (or even the placement of things in the vicinity of an item of interest).

erosion: (v. erode) The process that removes rock and soil from one spot on Earth's surface, depositing it elsewhere. Erosion can be exceptionally fast or exceedingly slow. Causes of erosion include wind, water (including rainfall and floods), the scouring action of glaciers and the repeated cycles of freezing and thawing that occur in many areas of the world.

fabric: Any flexible material that is woven, knitted or can be fused into a sheet by heat.

fiber: Something whose shape resembles a thread or filament. (in nutrition) Components of many fibrous plant-based foods. These so-called non-digestible fibers tend to come from cellulose, lignin, and pectin — all plant constituents that resist breakdown by the body's digestive enzymes.

field: An area of study, as in: *Her field of research was biology*. Also a term to describe a real-world environment in which some research is conducted, such as at sea, in a forest, on a mountaintop or on a city street. It is the opposite of an artificial setting, such as a research laboratory.

filter: (n.) Something that allows some materials to pass through but not others, based on their size or some other feature. (v.) The process of screening some things out on the basis of traits such as size, density, electric charge.

focus: (in behavior) To look or concentrate intently on some particular point or thing.

fossil fuel: Any fuel — such as coal, petroleum (crude oil) or natural gas — that has developed within the Earth over millions of years from the decayed remains of bacteria, plants or animals.

gel: A gooey or viscous material that can flow like a thick liquid.

graduate student: Someone working toward an advanced degree by taking classes and performing research. This work is done after the student has already graduated from college (usually with a four-year degree).

greenhouse gas: A gas that contributes to the greenhouse effect by absorbing heat. Carbon dioxide is one example of a greenhouse gas.

habitat: The area or natural environment in which an animal or plant normally lives, such as a desert, coral reef or freshwater lake. A habitat can be home to thousands of different species.

life cycle: The succession of stages that occur as an organism grows, develops, reproduces — and then eventually ages and dies. The succession of stages that occur as an organism grows, develops, reproduces — and then eventually ages and dies. Or the sum of all processes involved in creating a product, starting with the extraction of raw materials and ending with the disposal of the product when it's no longer useful. Indeed, engineers describe this as the cradle-to-grave life of a product.

manufacturing: The making of things, usually on a large scale.

materials scientist: A researcher who studies how the atomic and molecular structure of a material is related to its overall properties. Materials scientists can design new materials or analyze existing ones. Their analyses of a material’s overall properties (such as density, strength and melting point) can help engineers and other researchers select materials that are best suited to a new application.

metal: Something that conducts electricity well, tends to be shiny (reflective) and malleable (meaning it can be reshaped with heat and not too much force or pressure).

microplastic: A small piece of plastic, 5 millimeters (0.2 inch) or smaller in size. Microplastics may have been produced at that small size, or their size may be the result of the breakdown of water bottles, plastic bags or other things that started out larger.

microscope: An instrument used to view objects, like bacteria, or the single cells of plants or animals, that are too small to be visible to the unaided eye.

molecule: An electrically neutral group of atoms that represents the smallest possible amount of a chemical compound. Molecules can be made of single types of atoms or of different types. For example, the oxygen in the air is made of two oxygen atoms (O_2), but water is made of two hydrogen atoms and one oxygen atom (H_2O).

organic: (in chemistry) An adjective that indicates something is carbon-containing; also a term that relates to the basic chemicals that make up living organisms. (in agriculture) Farm products grown without the use of non-natural and potentially toxic chemicals, such as pesticides.

palladium: A soft, ductile, steel-white, tarnish-resistant, metallic element occurring naturally with platinum, especially in gold, nickel, and copper ores.

pandemic: An epidemic that affects a large proportion of the population across a country or the world.

petroleum: A thick flammable liquid mixture of hydrocarbons. Petroleum is a fossil fuel mainly found beneath the Earth’s surface. It is the source of the chemicals used to make gasoline, lubricating oils, plastics and many other products.

pigment: A material, like the natural colorings in skin, that alter the light reflected off of an object or transmitted through it. The overall color of a pigment typically depends on which wavelengths of visible light it absorbs and which ones it reflects. For example, a red pigment tends to reflect red wavelengths of light very well and typically absorbs other colors. Pigment also is the term for chemicals that manufacturers use to tint paint.

plastic: Any of a series of materials that are easily deformable; or synthetic materials that have been made from polymers (long strings of some building-block molecule) that tend to be lightweight, inexpensive and resistant to degradation.

pore: A tiny hole in a surface. On the skin, substances such as oil, water and sweat pass through these openings.

pulp: The fibrous inner part of a vegetable or fruit (such as an orange).

range: The full extent or distribution of something. For instance, a plant or animal's range is the area over which it naturally exists.

risk: The chance or mathematical likelihood that some bad thing might happen. For instance, exposure to radiation poses a risk of cancer. Or the hazard — or peril — itself. (For instance: *Among cancer risks that the people faced were radiation and drinking water tainted with arsenic*.)

sanitation: The protection of human health by preventing human contact with our own bodily wastes, through hand washing, use of things like use of toilets or latrines, separation of disposal of wastes from drinking-water sources and water, and cleaning water to rid of disease causing agents disinfecting foods and materials that may be ingested or otherwise enter the body.

society: An integrated group of people or animals that generally cooperate and support one another for the greater good of them all.

species: A group of similar organisms capable of producing offspring that can survive and reproduce.

sponge: Something that sops up liquids or other materials and holds them until squeezed out or removed in some other way. (in biology) A primitive aquatic animal with a soft, porous body.

surface area: The area of some material's surface. In general, smaller materials and ones with rougher or more convoluted surfaces have a greater exterior surface area — per unit mass — than larger items or ones with smoother exteriors. That becomes important when chemical, biological or physical processes occur on a surface.

sustainability: (adj: sustainable) To use resources in a way that they will continue to be available in the future.

synthetic: An adjective that describes something that did not arise naturally, but was instead created by people. Many synthetic materials have been developed to stand in for natural materials, such as synthetic rubber, synthetic diamond or a synthetic hormone. Some may even have a chemical makeup and structure identical to the original.

textile: Cloth or fabric that can be woven of nonwoven (such as when fibers are pressed and bonded together).

toxic: Poisonous or able to harm or kill cells, tissues or whole organisms. The measure of risk posed by such a poison is its toxicity.

variety: (in agriculture) The term that plant scientists give to a distinct breed (subspecies) of plant with desirable traits. If the plants were bred intentionally, they are referred to as cultivated varieties, or cultivars.

waste: Any materials that are left over from biological or other systems that have no value, so they can be disposed of as trash or recycled for some new use.

World Health Organization: An agency of the United Nations, established in 1948, to promote health and to control communicable diseases. It is based in Geneva, Switzerland. The United Nations relies on the WHO for providing international leadership on global health matters. This organization also helps shape the research agenda for health issues and sets standards for pollutants and other things that could pose a risk to health. WHO also regularly reviews data to set policies for maintaining health and a healthy environment.

CITATIONS

Journal: L. Lou, R.J. Kendall and S. Ramkumar. Comparison of hydrophilic PVA/TiO2 and hydrophobic PVDF/TiO2 microfiber webs on the dye pollutant photo-catalyzation. *Journal of Environmental Chemical Engineering*. Vol. 8, October 2020. doi: 10.1016/j.jece.2020.103914.

Journal: K. Niinimäki et al. The environmental price of fast fashion. *Nature Reviews Earth & Environment*. Vol. 1, April 7, 2020, updated April 23, 2020. doi: 10.1038/s43017-020-0039-9.

Journal: A. Liyanapathiranage et al. Nanocellulose-based sustainable dyeing of cotton textiles with minimized water pollution. *ACS Omega*. Vol. 5, April 17, 2020, p. 9196. doi: 10.1021/acsomega.9b04498.

Journal: S. Roos et al. A function-based approach for life cycle management of chemicals in the textile industry. *Sustainability*. Vol. 12, February 20, 2020. doi: 10.3390/su12031273.

Journal: S. Haslinger et al. Upcycling of cotton polyester blended textile waste to new man-made cellulose fibers. *Waste Management*. Vol. 97, September 2019, p. 88. doi: 10.1016/j.wasman.2019.07.040.

Journal: S, Haslinger et al. Recycling of vat and reactive dyed textile waste to new colored man-made cellulose fibers. *Green Chemistry*. Vol. 21, September 18, 2019, p. 5598. doi: 10.1039/C9GC02776A.

Journal: L. Lou et al. Visible light photocatalytic functional TiO2/PVDF nanofibers for dye pollutant degradation. *Particle & Particle Systems Characterization*. Vol. 36, September 2019, article 1900091. doi: 10.1002/ppsc.201900091.

Journal: J. Gu et al. Reagentless preparation of shape memory cellulose nanofibril aerogels decorated with Pd nanoparticles and their application in dye discoloration. *Applied Catalysis B: Enviornmental*. Vol. 237, December 5, 2018, p. 482. doi: 10.1016/j.apcatb.2018.06.002.

Journal: G. Sandin and G. Peters. Environmental impact of textile reuse and recycling – A review. *Journal of Cleaner Production*. Vol. 184, May 2018, p. 353. doi: 10.1016/j.jclepro.2018.02.266.

Book: P. Rivoli. The Travels of a T-shirt in the Global Economy. 2nd ed. Hoboken, N.J.: Wiley, November 2014.

Fact sheet: B. Reed and B. Reed. How much water is needed in emergencies. Water, Engineering and Development Centre, Loughborough University. World Health Organization Technical Note. 2013.

Journal: A. Chapagain et al. The water footprint of cotton consumption: An assessment of the impact of worldwide consumption of cotton products on the water resources in the cotton producing countries. *Ecological Economics*. Vol. 1, November 1, 2006, p. 186. doi: 10.1016/j.ecolecon.2005.11.027.

About Kathiann Kowalski

Kathiann Kowalski reports on all sorts of cutting-edge science. Previously, she practiced law with a large firm. Kathi enjoys hiking, sewing and reading. She also enjoys travel, especially family adventures and beach trips.

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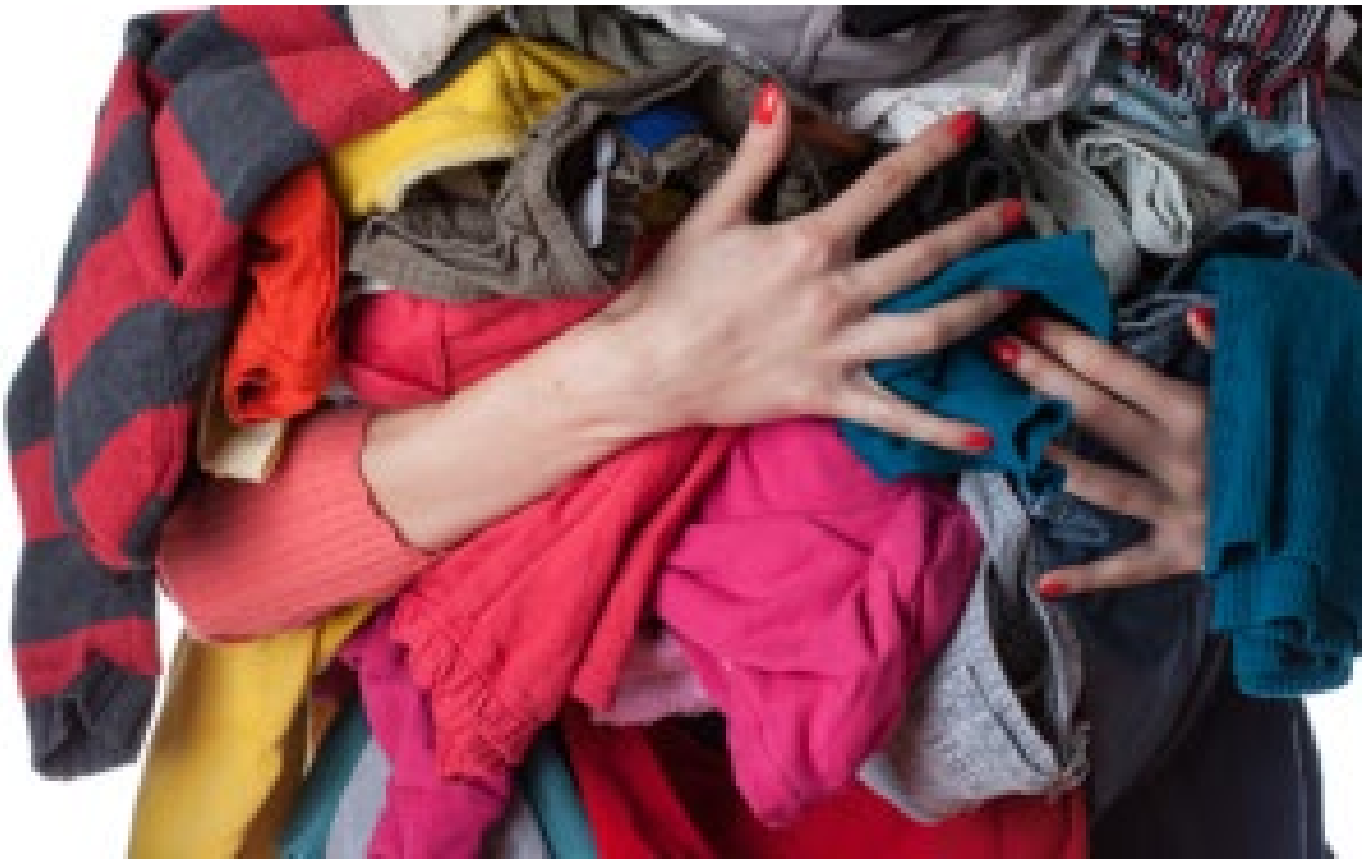

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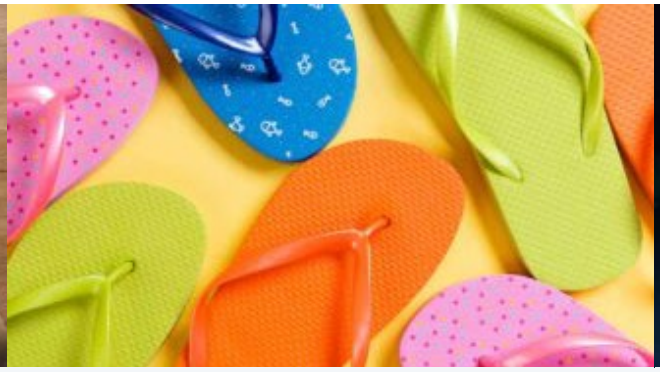

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