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A DISCOVERY MAKES THE LIGHT FANTASTIC

This film does everything but make pictures

And now, from the folks who brought you those little sticky Post-it Notes comes what could be another ubiquitous product: Multilayer Birefringent Light Management Film! Huh? Sounds more like a doctoral dissertation than a product, but 3M Corp. of St. Paul, Minn., expects that five years from now it will be selling a billion dollars' worth of it annually. And despite the unartful name, the stuff is an eye-popping wonder to behold. It does magic with light. Some versions are the most brilliant mirrors ever made. Others are semitransparent but explode in dazzling color.

"Sometimes we just sit and look at it," said Andrew Ouderkirk, the leader of the engineering team that came up with the film under 3M's "15 percent rule" that lets its inventors spend that portion of their time on almost anything they want. One member of the team fashioned a sheet of the new film into a small sack. "One of our favorite things about this bag of light is that it almost seems to glow . . . to be illuminated from within," Ouderkirk says. Gazing inside is like staring into a sci-fi-film special effect, with saturated, prismatic colors shifting across the spectrum as the bag crinkles and moves.

But 3M's marketers don't plan to sit and stare at bags of light. The film's first commercial uses, now reaching the market, are as backing for flat-panel displays--it makes the screens on laptop computers and personal organizers 30 percent brighter. And when futuristic "photonic computers" become available--these use different colored streams of light rather than electrons to carry information--the new film can be used as a precise, efficient color filter to separate frequencies cleanly as they carom through the processor. Another mutation likely to find plenty of buyers is a "cold mirror," which reflects visible light at nearly 100 percent efficiency but lets heat-carrying infrared radiation go right

through. That's useful to the building trade. Light pipes--large tubes lined with cold mirror film--could deliver bright sunshine from skylights into a room without overheating the room. Alternatively, Ouderkirk says, a film that reflects infrared radiation but lets the sun shine through could keep greenhouses bright but cool. The new film could mark the end, however, of the cardboard windshield barriers that block light in shadeless parking lots. Transparent car windows with a coating of light-management film could keep interiors from baking when an auto is parked in the sun for a couple of hours. And there's more car talk from Kevin Kuck, one of 3M's general managers, who figures shatterproof reflectors, such as on auto rearview mirrors, could catch on.

Butterfly wings. Part of the inspiration for the film's optical qualities came from nature. The iridescent colors in many butterflies, the brilliant hues from an oil sheen floating on water, and the colors emerging from inside an abalone shell all come from the refraction of light as it passes through and reflects between thin layers of transparent material. About as thick as typing paper, a sheet of the film contains hundreds of alternating layers of flexible polymers or plastics with slightly different optical qualities. By themselves the layers are each transparent, but stacked up they trap, refract, and reflect light in ways never seen before.

Depending on the exact specs, a sheet may reflect more than 99 percent of the light that hits it rather than the 95 percent that bounces off a common metal-coated glass mirror like the one on your medicine cabinet. Or, with slightly different thicknesses and chemistry to the layers, vibrant colors emerge from it as light of various wavelengths rattles around among its many internal interfaces. The material was featured on the cover of the nation's leading research journal earlier this year when Science recounted how the 3M team found a loophole in a 200-year-old canon of optical physics called Brewster's Law, named for the 19th-century Scot who discovered it. Brewster said that light reflects at varying efficiencies depending on the angle at which, after crossing through one material, it reaches the surface of another. The new film, thanks to the way its molecules are oriented, can be tailored to reflect selective wavelengths almost perfectly no matter which direction they come from.

An advanced degree in science isn't required, however, to use the stuff. The colorful, flexible film makes sensational ribbon and wrapping paper bursting with shifting color. The company also plans to cut it up finely as glitter (because it doesn't oxidize, it stays shiny longer than standard metal glitter) and may put tiny motes of it in cosmetics. 3M won't say exactly what it costs to make, only that it's cheap. "We can turn it out by the mile," said one company rep. No comment from the company, either, on whether it makes a suitable party dress.

PHOTO (COLOR): A dress fashioned from film can't be bought off the rack.

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By Charles W. Petit
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