"Nature uses a few materials elegantly, rather than lots of materials haphazardly."

Nadine Fattaleh
Clark College chemistry professor.

Research reveals rose petals' dual nature

They both repel, attract water droplets, inspiring new products

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By TOM VOGT
Columbian staff writer

"Raindrops on roses and whiskers on kittens …

"These are a few of my favorite things."

It's a pretty image, but there's plenty of science behind the interplay of raindrops and roses.

Chinese researchers have studied the so-called petal effect, and the title of their report echoes another lyric from a Julie Andrews song.

It's a …

"Superhydrophobic state with high adhesive forces!"

THE NATURE OF THINGS SCIENCE

According to Chinese researchers, the petal of a red rose has a curious relationship with water. A rose petal can be both "water hating" (hydrophobic) and "water loving" (hydrophilic).

If a water droplet is small enough, it won't roll off even when the petal is turned upside down.

But a rose in a downpour will remain fairly dry, with larger raindrops rolling off. The 2008 report from four Chinese universities and research centers was distributed by the American Chemical Society.

The petal's split personality was analyzed with the help of a scanning electron microscope. While the rose petal is silky to the touch, its microscopic map shows a different terrain.

"It's not smooth," said Nadine Fattaleh, a Clark College chemistry professor. "It has hills and valleys."

It's that irregular landscape of

ROSES, *Page C7*

ZACHARY KAUFMAN/The Columbian

A rose collects water droplets in front of a home on S Street near East Evergreen Boulevard during a recent rainy spell.

Roses:

From Page C1

small valleys and deep rifts that creates the rose petal's two responses to water.

The small valleys and folds repel larger droplets. But the larger valleys allow water to seep in slightly so the smaller droplets can wet the rose petal and stick to the blossom.

It's inspired lovely lyrics and wonderful photographs. But the phenomenon also has inspired breakthroughs in nanotechnology, Fattaleh said.

The same process that helps a rose petal shed a water droplet can be used in making weatherproof clothing.

"It's led to new materials," Fattaleh said. "You see it when you buy a microfiber shirt that repels stains and liquids."

The report adds that the process can be used for large-scale fabrication and industrial production.

By following the example of nature, "We can design a process so we don't have to make (a material) in the first place," Fattaleh said. "That's really what's driving a lot of research."

The structure of that rose petal, for example, can be duplicated in the lab.

"You can use it as a mold and reproduce that surface," Fattaleh said.

The Chinese researchers described how they used a two-step process to copy — "biomimic" — the surface of the rose petal.

A thin film was applied to the surface of the petal. When it was peeled off, that film was imprinted with a negative image of the structure, which provided a template for duplicating the rose petal's surface.

While laboratories are turning a stream of new compounds into the sources of new products, nature makes do with the same old chemistry set.

"Nature does so much with so little," Fattaleh said.

"Nature uses a few materials elegantly, rather than lots of materials haphazardly."

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