# An ecological rule for animals applies to flowers

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When, in 1833, Constantin Wilhelm Lambert Gloger published his key observation that warm-blooded animals tend to be more heavily pigmented or darker the closer they live to the equator, he probably didn't realize the degree to which the climate would change in the next 200 years or so.

This week, University of Pittsburgh researchers Matthew Koski and Tia-Lynn Ashman proved that the same phenomenon described by Gloger, a German zoologist, exists among flowers. Their paper, "Floral pigmentation patterns provide an example of Gloger's rule in plants," was published Jan. 8 in the first issue of *Nature*'s new journal *Nature Plants*. The finding expands our understanding of biological responses to global climate change, Koski and Ashman say.

One of the reasons investigators have not pursued proof of Gloger's rule in flowers is that pollinators, such as bees, don't see what we see when they look at a flower. They see in the ultraviolet as well as visible ranges. What appears bright yellow to a person can appear dark or patterned to a bee.

Koski, the lead author, is pursuing his PhD in Ashman's lab in the Department of Biological Sciences within Pitt's Kenneth P. Dietrich School of Arts and Sciences. Ashman, the senior author, is a professor and associate chair of biological sciences. Koski says that he and Ashman studied the flowers of *Argentina anserina*, a plant in the rose family, across four lines of latitude—three in the Northern and one in

the Southern Hemisphere.

Using ultraviolet imaging, the pair examined the "bull's-eye" centers of the flowers (that look dark to pollinators) and discovered that they were larger the nearer to the equator the flowers grew. Larger "bull's-eyes," Koski explains, are associated with higher levels of ultraviolet light, which is more intense near the equator.

Koski and Ashman then hypothesized that bigger bull's-eyes absorb more ultraviolet light, functioning as a protective trait because high ultraviolet light levels are known to damage DNA. In their study, they confirmed that extreme ultraviolet light reduces the viability of pollen (gametes) in *Argentina anserina*.

One might predict then that as the Earth receives more ultraviolet light at extreme northern and southern climes due to depletion of the ozone layer, flowers farther from the equator are likely to begin to evolve traits, such as larger ultraviolet light-absorbing bull's-eyes, that are beneficial to their survival. However, this may come at a cost as bigger bull's-eyes obscure the 'sweet center' of the flower where pollen and nectar rewards are found, thus making poorer targets for pollinators.

"Spring is coming earlier, and plants and pollinators are no longer in sync," Ashman says. "Increased ultraviolet radiation is causing the same sort of disruption."

Provided by University of Pittsburgh