

Seeing Red

*The facts and fictions
of crimson perception*

Red is a powerful color. It's the color of Cupid and the Devil, the color of love and hate. It brings to mind hot-blooded anger and *Scarlet Letter* shame. It means luck in China, where bridal wear is red, mourning in parts of Africa and sex in Amsterdam's red-light district.

Some of the hue's significance has a biological basis. Many humans get red in the face from increased blood flow when they are angry. A similar process activates a flush of embarrassment or a more flirtatious blush. Seeing red also triggers some surprising behaviors. For

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THE WOMAN IN RED

From the iconic scarlet soles on Christian Louboutin shoes to the gowns of starlets at the Oscars, wearing red turns heads. Psychologists Andrew J. Elliot and Daniela Niesta Kayser, both then at the University of Rochester, found that male experimental participants perceived women as more attractive and sexually desirable when wearing red, as compared with seeing the same women in other colors or achromatic hues. Somehow red causes a viewer to favor one candidate over another.

In a different look at the color's allure, Nicolas Guéguen of the University of South Brittany in France asked female confederates to wear red, pink or brown lipstick, or none at all, while sitting at a bar. Men approached women in red lipstick fastest and most often. Heightened contrast between eyes, lips and other facial features may make faces appear more feminine.

instance, drivers blocked in traffic by a red car react faster and more aggressively than drivers barred by vehicles of other colors.

Perhaps the most famous example of the pigment's power comes from animal

perception. For hundreds of years matadors have taunted bulls by flashing a red cape. According to bullfighting lore, the color choice is said to help hide bloodstains, but it may have other advantages. Whereas humans are trichromats—

meaning that we have three types of retinal cones sensitive to long (red), medium (green) and short (blue) wavelengths—cattle are dichromats: they possess only two kinds of cones.

Perceptual measurements indicate that cattle can discriminate red from green and blue but not green and blue from each other. Moreover, researchers have found that cattle are more active and aroused in red light than in blue or green light. Another study reported that although fighting bulls may charge all sorts of moving objects, the charges car-

ry greater force when directed against warm colors such as red.

In the 1960s the late Spanish-born neuroscientist José M. R. Delgado, then at Yale University, pitted the lure of the red matador's cape against the power of direct brain stimulation by testing whether electronic brain implants could stop a charging bull in its tracks. With the implants linked to a remote control, Delgado climbed into an arena in Córdoba, Spain, and enraged the bull with his cape. His move was a bold one: if Delgado's idea to directly stimulate the caudate

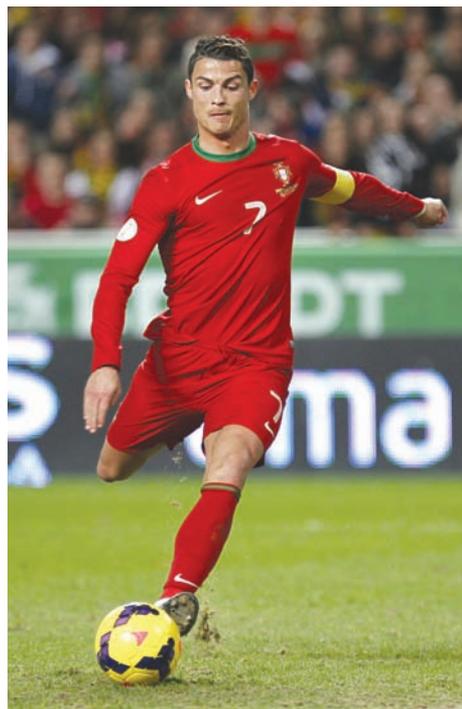
nucleus, an area involved in voluntary motion, failed, he would pay the ultimate price. The bull charged—*¡Olé!*—but Delgado remembered to mash the remote's button in the nick of time, stopping the toro mid-charge. Even if red has the power to lure a bull to attack, little, if anything, can beat direct brain stimulation.

As the examples that follow illustrate, red regularly sways behavior. Charged with social and cultural meanings, it is a powerful enhancer, sending signals that may not really reflect an entity's true nature. **M**

RED BADGE OF COMPETITION

In some species, red coloration signals testosterone-driven dominance. Evolutionary anthropologists Russell A. Hill and Robert A. Barton, both at Durham University in England, thus reasoned that red might confer a competitive edge in humans. They analyzed the outcomes among contestants, based on attire, in four combat sports in the 2004 Summer Olympic Games: boxing, tae kwon do, Greco-Roman wrestling and freestyle wrestling.

Throughout the games, red and blue outfits and protective gear were assigned randomly to the athletes. If color had exerted no influence, there should have been an approximately equal number of wins and losses for the two hues. This was not the case, however. In all four sports, contestants wearing red won more fights than those in blue. The advantage was most pronounced when the participants were well matched. A few possible explanations for this result are that the referees favored red fighters, that crimson-clad combatants felt more powerful or that the color made opponents cower. Whatever the reason, the red athletes had a critical advantage over rivals—even if the edge was illusory. Hill and Barton found similar results in an international soccer tournament, suggesting that the color of sportswear may affect a variety of sporting outcomes.



FRANCISCO SECO AP Photo (Cristiano Ronaldo); DANIEL HEUCLIN Corbis (Sonoran mountain king snakes)



FALSE ADVERTISING

In the animal kingdom, a flash of crimson can be a warning sign. As the venomous Sonoran coral snake of western North America reveals, the color is often code for poison, keeping predators away. But other creatures can exploit this signal to their advantage. The Sonoran mountain king snake (shown at left), for example, is safer prey but is covered in red stripes that may trick other animals into thinking it is toxic. Biologists call this kind of resemblance Batesian mimicry, named after the naturalist, Henry Walter Bates, who first described the adaptation in the mid-19th century.

THE MOST VISIBLE FIRE TRUCK

Stop signs, danger warnings, fire extinguishers—people commonly assume that they are colored red because the hue is intrinsically more attention-grabbing. But ruby's reputation may be oversold. When one of us (Macknik) worked as a firefighter at what was then the University of California, Santa Cruz, Fire Department as an undergraduate student, he was initially disappointed to find out that its trucks were painted lime yellow. At the end of his first day on the job, he asked then fire captain Paul Babb why. "Because they're not ripe yet," Babb deadpanned.

In fact, public safety department records show that the probability of a visibility-related accident is higher for a red or red-and-white pumper than for a lime-yellow fire truck. Lime yellow, which falls in the middle of the color spectrum, is easy to see during the day, when we rely on our trichromatic cone vision, and is the most visible wavelength at night, when human vision is dominated by achromatic rods rather than cones. Red may mean fire, but lime yellow is the real eye-catcher.



COLOR OF PAIN



Red may intensify the experience of pain, according to recent research. Neuroscientist Maria Victoria Sanchez-Vives and her colleagues at the University of Barcelona in Spain applied heat to the wrists of experimental subjects experiencing a virtual environment through a head-mounted display.

As the intensity of the heat rose, participants saw virtual arms become increasingly red (top right), blue (top left) or green (top center) and pressed a button whenever the sensation became painful. In an additional experimental condition (bottom), a gray dot close to the virtual arm turned red as the temperature increased, but the color of the arm itself remained unaltered. Of all four conditions, subjects experienced pain earliest (that is, at the lowest temperatures) when the virtual arm was red. So much for looking at life through rose-colored glasses!



FURTHER READING

- **Fire Truck Visibility: Red May Not Be the Most Visible Color, Considering the Rate of Accident Involvement with Fire Trucks.** Stephen S. Solomon and James G. King in *Ergonomics in Design*, Vol. 5, No. 2, pages 4–10; April 1997.
- **Sporting Contests: Seeing Red? Putting Sportswear in Context.** Candy Rowe, Julie M. Harris and S. Craig Roberts in *Nature*, Vol. 437, page E10; October 27, 2005.
- **Romantic Red: Red Enhances Men's Attraction to Women.** Andrew J. Elliot and Daniela Niesta in *Journal of Personality and Social Psychology*, Vol. 95, No. 5, pages 1150–1164; November 2008.
- **Does Red Lipstick Really Attract Men? An Evaluation in a Bar.** Nicolas Guéguen in *International Journal of Psychological Studies*, Vol. 4, No. 2, pages 206–209; June 2012.