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True Blue Stands Out in an Earthy Crowd

OCT. 22, 2012



NATURAL COLOR: Wild blueberries ready for harvesting in Warren, Me.

Robert F. Bukaty/Associated Press

Basics

By NATALIE ANGIER

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For the French Fauvist painter and color gourmand Raoul Dufy, blue was the only color with enough strength of character to remain blue “in all its tones.” Darkened red looks brown and whitened red turns pink, Dufy said, while yellow blackens with shading and fades away in the light. But blue can be brightened or dimmed, the artist said, and “it will always stay blue.”

Scientists, too, have lately been bullish on blue, captivated by its optical purity, complexity and metaphorical fluency. They’re exploring the

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physics and chemistry of blueness in nature, the evolution of blue ornaments and blue come-ons, and the sheer brazenness of being blue when most earthly life forms opt for earthy raiments of beige, ruddy or taupe.

One research team recently reported the structural analysis of [a small, dazzlingly blue fruit from the African *Pollia condensata* plant](#) that may well be the brightest terrestrial object in nature. Another group working in the central Congo basin announced the [discovery of a new species of monkey](#), a rare event in mammalogy. Rarer still is the noteworthiest trait of the monkey, called the lesula: a patch of brilliant blue skin on the male's buttocks and scrotal area that stands out from the surrounding fur like neon underpants.

Still other researchers are tracing the history of blue pigments in human culture, and the role those pigments have played in shaping our notions of virtue, authority, divinity and social class. "Blue pigments played an outstanding role in human development," said Heinz Berke, an emeritus professor of chemistry at the University of Zurich. For some cultures, he said, they were as valuable as gold.

As a raft of surveys has shown, blue love is a global affair. Ask people their favorite color, and in most parts of the world roughly half will say blue, a figure three to four times the support accorded common second-place finishers like purple or green. Just one in six Americans is blue-eyed, but nearly one in two consider blue the prettiest eye color, which could be why some 50 percent of tinted [contact lenses](#) sold are the kind that make your brown eyes blue.

Sick children like their caretakers in blue: A recent study at the Cleveland Clinic found that young patients preferred nurses wearing blue uniforms to those in white or yellow. And am I the only person in the United States who doesn't own a single pair of those permanently popular pants formerly known as dungarees?

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“For Americans, bluejeans have a special connotation because of their association with the Old West and rugged individualism,” said Steven Bleicher, author of “Contemporary Color: Theory and Use.” The jeans take their John Wayne reputation seriously. “Because the indigo dye fades during washing, everyone’s blue becomes uniquely different,” said Mr. Bleicher, a professor of visual arts at Coastal Carolina University. “They’re *your* bluejeans.”

According to [psychologists](#) who explore the complex interplay of color, mood and behavior, blue’s basic emotional valence is calmness and open-endedness, in contrast to the aggressive specificity associated with red. Blue is sea and sky, a pocket-size vacation.

In a study that appeared in the journal *Perceptual & Motor Skills*, researchers at Aichi University in Japan found that subjects who performed a lengthy video game exercise while sitting next to a blue partition reported feeling less fatigued and claustrophobic, and displayed a more regular [heart beat](#) pattern, than did people who sat by red or yellow partitions.

In the journal *Science*, researchers at the University of British Columbia described their study of how computer screen color affected participants’ ability to solve either creative problems — for example, determining the word that best unifies the terms “shelf,” “read” and “end” (answer: book) — or detail-oriented tasks like copy editing. The researchers found that blue screens were superior to red or white backgrounds at enhancing creativity, while red screens worked best for accuracy tasks. Interestingly, when participants were asked to predict which screen color would improve performance on the two categories of problems, big majorities deemed blue the ideal desktop setting for both.

But skies have their limits, and blue can also imply coldness, sorrow and death. On learning of a good friend’s suicide in 1901, Pablo Picasso fell into a severe [depression](#), and he began painting images of beggars, drunks, the poor and the halt, all famously rendered in a palette of blue.

The provenance of using “the blues” to mean sadness isn’t clear, but L. Elizabeth Crawford, a professor of [psychology](#) at the University of Richmond in Virginia, suggested that the association arose from the look of the body when it’s in a low energy, low oxygen state. “The lips turn blue, there’s a blue [pallor](#) to the complexion,” she said. “It’s the

opposite of the warm flushing of the skin that we associate with love, kindness and affection.”

Blue is also known to suppress the appetite, possibly as an adaptation against eating rotten meat, which can have a bluish tinge. “If you’re on a diet, my advice is, take the white bulb out of the refrigerator and put in a blue one instead,” Mr. Bleicher said. “A blue glow makes food look very unappetizing.”

Not so to those that would dine upon us. Field studies of color-coded insect traps have shown that mosquitoes are particularly attracted to blue.

That blue can connote coolness and tranquillity is one of nature’s little inside jokes. Blue light is on the high-energy end of the visible spectrum, and the comparative shortness of its wavelengths explains why the blue portion of the white light from the sun is easily scattered by the nitrogen and oxygen molecules in our atmosphere, and thus why the sky looks blue.

Down on earth, organisms assume many of their colors with pigments, chemical substances that selectively absorb some wavelengths of light and reflect others — the ones we then see as the object’s color. Plants look green because the chlorophyll pigment in their leaves absorbs pretty much all sunlight except green. Cardinals owe their flaming feathers to [carotenoids](#), orange-reflecting pigments the birds extract from ingested berries and insects.

When it comes to blueness, though, the chemical approach is not always an option. Fungi, crabs and beetles may do cerulean, said the Yale ornithologist Richard O. Prum, “but for some reason, vertebrate physiology never evolved the ability to make or use blue pigments.”

In place of blue pigment, vertebrates and others turn to figment. As Dr. Prum and others have determined lately, many of nature’s most spectacular blues — the plumage of a blue jay or indigo bunting, the teal of a skink lizard’s tail, and now the lesula monkey’s blue scrotum and Pollia’s shimmering blue fruit — are structural in nature. They arise from the specific shape and arrangement of their underlying components.

“When you have a color obtained with pigment, it’s a characteristic of the material itself,” said Silvia Vignolini, a physicist at the University of

Cambridge and the lead author of the new report about the *Pollia condensata*. “When you make color with structure, you start with a material that is transparent, but by changing the structure by just a few hundred nanometers” — billionths of a meter — “you can change the color.”

Dr. Vignolini cited the analogy of soap bubbles, which begin as clear liquid and then assume different hues depending on their size, the thickness of their membranes and the angle at which they’re viewed. Structural blues are essentially built of soap membranes trapped at just the right orientation and thickness to forever glint blue.

Stacking style counts, too. Sometimes the color-forming components are arrayed in a so-called quasi-ordered formation, a mix of regularity and randomness, like spaghetti packed in a box. That pattern yields the steady matte blues of the jay’s feathers and the monkey’s pelvis. In other cases, the constituent bubbles are more strongly periodic in their arrangement, like atoms in a crystal, and the resulting blues possess the glittering, iridescent sheen seen in the wings of a blue morpho butterfly or, brighter still, the *Pollia* fruit. Dr. Vignolini and her colleagues determined that the lentil-size fruit reflected back 30 percent of the light cast upon it, the highest reflectivity for any land-based biological product known.

The bold blue covering turns out to be a bit of a cheap trick, designed to attract birds and other potential seed dispersers without bothering to invest in the expensive quid pro quo of a pulp. “The fruit has no nutritional value,” Dr. Vignolini said. “It doesn’t harm birds, but it doesn’t benefit them, either.”

The ruse doesn’t fade with time. “We have some samples in our collection that are almost 100 years old,” Dr. Vignolini said, “and they look the same as the fruit growing today,”

In life as in art, blue will always stay blue.

Correction: November 27, 2012

The Basics column on Oct. 23, about the color blue, included an incorrect title for Steven Bleicher, who commented that “for Americans, bluejeans have a special connotation because of their association with the Old West and rugged individualism.” As the article noted, he is a professor of visual arts at Coastal Carolina

University; he is not “Dr. Bleicher.” (This correction was delayed because an e-mail from Professor Bleicher pointing out the error went astray at The Times.)

A version of this article appears in print on October 23, 2012, on page D1 of the New York edition with the headline: True Blue Stands Out in an Earthy Crowd. Order Reprints | Today's Paper | Subscribe

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