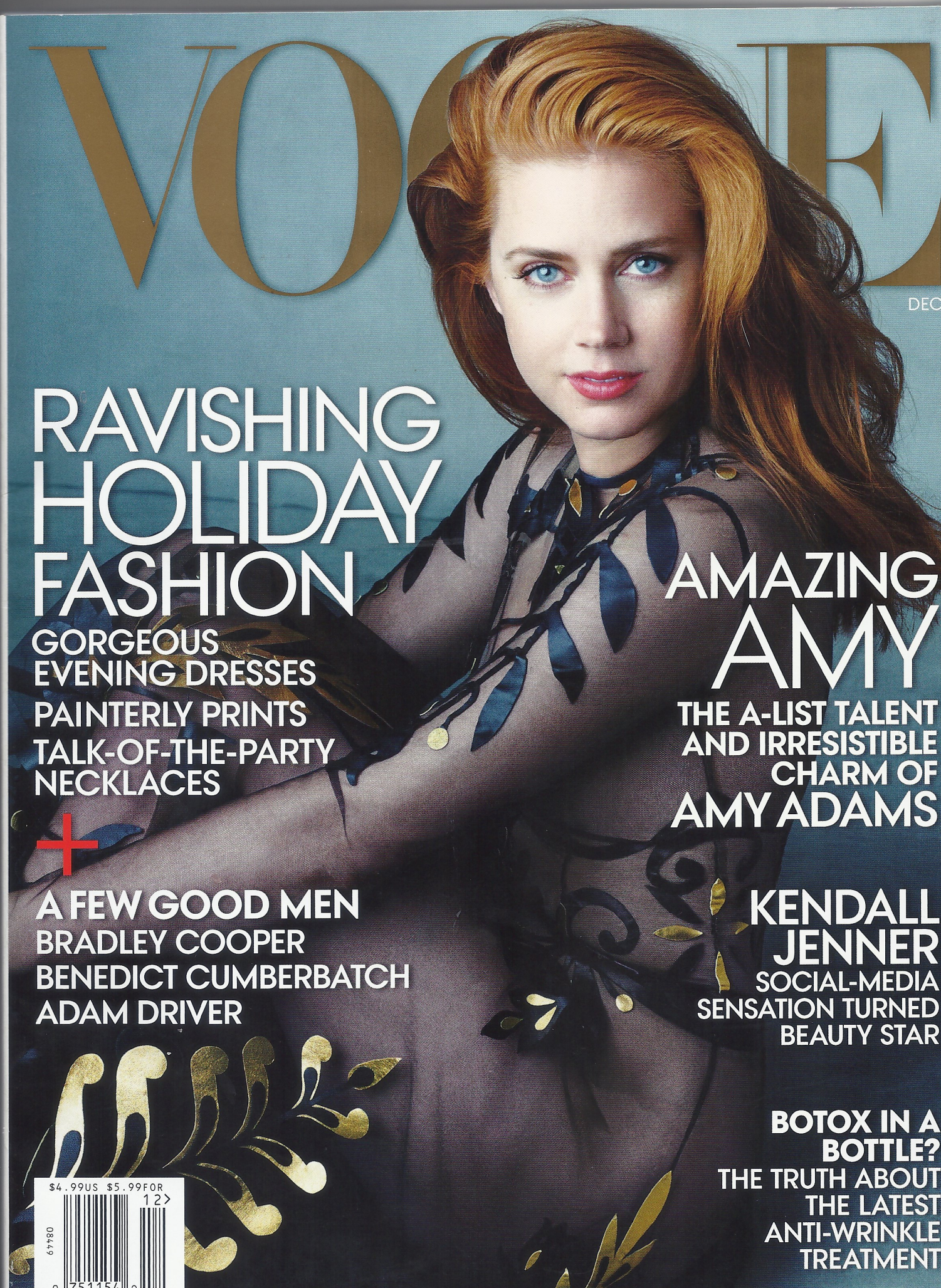
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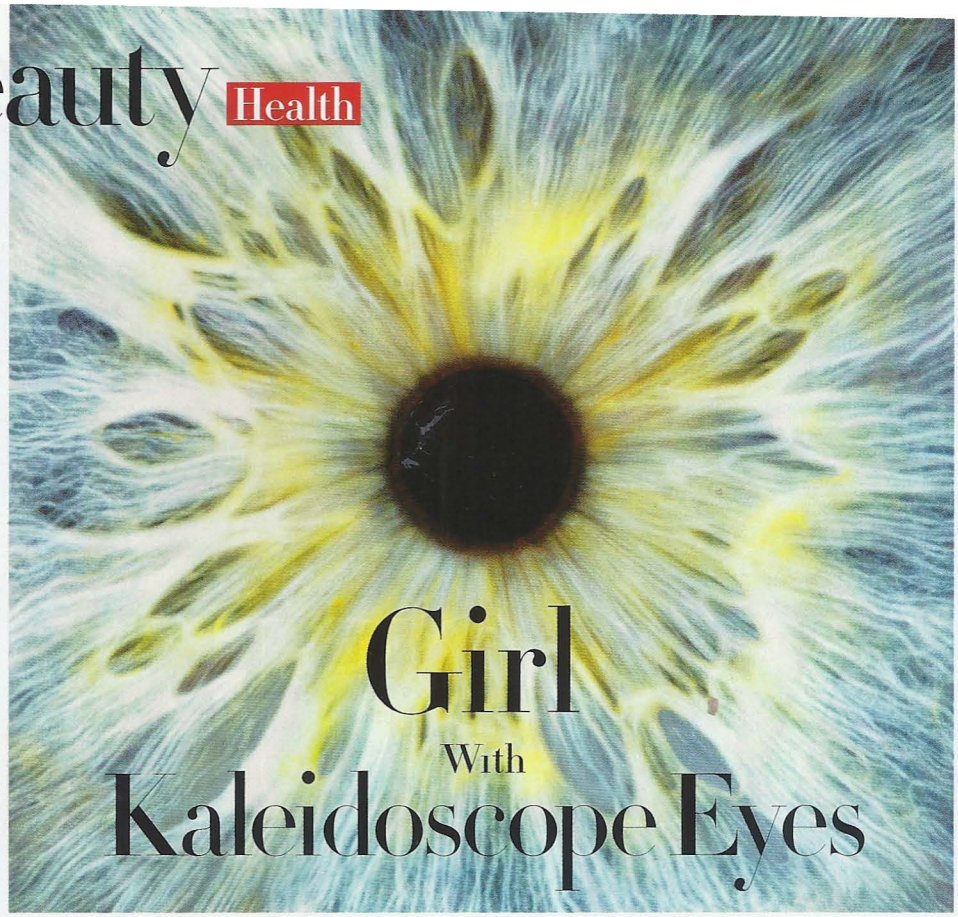

Girl With Kaleidoscope Eyes

FULL SPECTRUM WOMEN WITH THE TETRACHROMACY GENE CAN SEE UP TO 100 TIMES MORE COLORS THAN PEOPLE WITH NORMAL SIGHT.

A NEWLY DISCOVERED GENETIC CONDITION HAS BEEN FOUND TO GIVE SOME WOMEN SUPERHUMAN VISION. MAUREEN SEABERG IS ONE OF THEM.

A little over a decade ago I took a trip to Ireland, where the owners of my bed-and-breakfast called me to a window to look out at the fields. I had arrived late the night before and hadn't yet seen the countryside in all its verdant glory. "Do you see them, the 40 shades of green?" my host asked. For most people, the old Irish cliché is hyperbole, but to me it was a gross understatement—I could see 40 shades in a single blade of grass. "There are so many more than that," I said, smiling at the sight of emerald, yes, but also peridot and jade and malachite and sea glass and verdigris and everything in between.

After this and countless episodes like it, it began to dawn on me that there was something unusual about the way I see the world. Then, in the summer of 2013, I made a discovery that finally offered an explanation: I have the genetic potential for a trait called tetrachromacy. This means I have a mutation in my genes that creates additional color receptors in my retinas, giving me the potential to see up to 100 times more than the one million shades seen by normal people, or "trichromats." Trichromats have three classes of pigment receptors (also known as cones); I have four. We tetrachromats are always women, and as much as 12 percent of the female population carries these extra genes—though a much smaller proportion are what are known as functional tetrachromats, or those who can actually perceive all the colors their eyes are equipped to see. Researchers think tetrachromatic vision, like a muscle that can be developed or unused, often lies dormant. It is only when a woman hones her extra color receptors through, say, artistic training—thereby teaching her brain to perceive additional shades—that she becomes a functional tetrachromat.

I first heard the term *tetrachromacy* on Radiolab, the public-radio science podcast. It featured an interview with tetrachromat Susan Hogan, an interior designer from Pittsburgh who recounted her lifelong obsession with color. On the program she observed pinks and reds in an apparently blue sky, undertones invisible to everyone around her. As she talked about her enhanced color perception, I flashed back to my experience in Ireland, and to all the times I had felt as if I were seeing the world in a kind of enhanced, kaleidoscopic, dimension. At last, it was all starting to make sense.

That afternoon I called a specialist interviewed on the show: Jay Neitz, Ph.D., professor of ophthalmology at the University of Washington, Seattle. One of the country's leading vision scientists, he told me something remarkable: Women with the tetrachromacy gene may actually be further along in the evolutionary process than others. "The development of trichromatic vision in the ancestors of modern primates may have been key to the evolution of humankind, and tetrachromacy may be another leap," he explained. After learning that my brother has some color blindness (tetrachromat females often have close male relatives who are color-blind), he mailed me a DNA test, and later wrote to confirm that I do indeed have the genetic basis for tetrachromacy.

Proving whether my condition is functional—whether I can in fact see all the extra colors my eyes are capable of detecting—is much harder. There are HEALTH>234

several approaches, from being tested on a special computer monitor with a broader color spectrum (ordinary monitors are built by and for trichromats) to blending colored light projections with a joystick to try to match a given color. Both methods are far from infallible; equally difficult is finding subjects willing to complete the long hours of testing—hence the nascent nature of the data.

Tetrachromacy in humans is a relatively new discovery (the trait is well documented in other species—bumblebees, zebra finches, and goldfish are among my many tetrachromat counterparts in the animal kingdom). In the U.K., Gabriele Jordan, Ph.D., senior lecturer at Newcastle University's Institute of Neuroscience, reported on the first genetically proven human case in the July 2010 *Journal of Vision*. In a landmark paper, she described her rigorous testing of a mysterious subject referred to only as "cDa29" and how she met the criteria for behavioral, or functional, tetrachromacy. Jordan has since found others, but it has not been easy. "It is extremely difficult to identify tetrachromats 'behaviorally,' " she says. "There are many more individuals who have the genetic disposition than there are individuals who use it perceptually."

SHE SAW PINKS AND REDS IN AN APPARENTLY BLUE SKY, INVISIBLE TO EVERYONE AROUND HER

What is known is that those tetrachromats who are able to perceive all the additional colors their eyes can see are often high achievers in the fields of design and the visual arts. Kimberly A. Jameson and Alissa D. Winkler, both Ph.D.'s, study the trait at the Human Tetrachromacy Research Collaborative at the University of California in Irvine. Jameson says there are several possible explanations for this: "Maybe at an early age it intrigues them that the trichromat adults around them don't seem to care about color precision. They may take an interest in creative hobbies, and later in creative occupations."

In an effort to better understand tetrachromacy, I tracked down some of my fellow superseers. Many of them have devoted their lives to working with color. Megan Arquette, an interior designer from Los Angeles, recalls waxing lyrical over the color of the sidewalk after a rainstorm. "For me, these everyday things are absolutely alive with depth and hue," she said. "But trying to describe what I experience is a little like trying to describe to a blind person what it's like to see. I don't know what you don't see, so I'm not sure how to fill in the blanks."

Painter Concetta Antico, who lives in San Diego, has been aware of her unusual powers of vision since childhood and now creates oil paintings in kaleidoscopic, almost hallucinogenic shades. In a preliminary paper on the artist about to be published in the journal *Glimpse,* Jameson attributes to Antico "the perfect storm" of conditions for functional tetrachromacy: the genetic basis for the trait together with her lifelong interaction with color through her work as an artist. Antico, meanwhile, describes her tetrachromacy as a kind of "super vision," allowing her to see the "cacophony of color" at play around her.

A lot of research remains to be done before we fully understand tetrachromacy, but the signs are exciting. Neitz is already working on using his findings on the trait to cure color blindness, while tetrachromacy's role in the field of technology is only just beginning to be explored. It is thought, for instance, that tetrachromat women have a heightened ability to read 3D satellite imagery, making them potentially invaluable assets in the defense industry. And in the worlds of design and the visual arts, their promise is almost limitless. From formulating innovative shades of makeup to creating art that gives us new insight into the natural world, expanding the existing, trichromatic palette could mark the beginning of a new chapter in our visual history. □ BEAUTY>236

Scent

WAX Poetic

Leave it to Hermès to reimagine home fragrance with a dose of playful surrealism. This month, the French house famed for its adherence to the artisanal launches Le Parfum de la Maison, a collection of scented objects that takes its inspiration from the art of origami. Produced in Limoges, the storied seat of porcelain production, and designed by Guillaume Bardet, the striking set of candles—matte-finish vessels hand-lacquered on the inside—mimics the appearance of deconstructed folded paper, and varies from the diminutive (perfect for an accent table) to the oversize (centerpieces approximating a flowerpot). The five scents, which blend elements like spice, leather, and old books, or moss and rain-dampened trees, were devised by perfumer Céline Ellena, who wasn't interested in replicating traditional one-note fragrances: "If you want to smell roses, buy real roses," she contends. Bardet dreamed up a fragranced white pebble (ideal for a lingerie drawer) and recast Hermès's emblematic horse as a pocket-size perfumed sculpture constructed from Italian paper and deftly folded by a Chinese artisan. Imagine it standing guard on a hotel bedside table, discreetly scenting the room.—MIEKE TEN HAVE

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