Blue Light and Vision

It's well established that blue light from lightbulbs and our devices stop production of melatonin, the sleep hormone, and can have a big impact on sleep latency, duration and quality. Blue light, however does a lot more damage than just affecting sleep. Researchers have connected the high-energy visible light, which emanates from both the sun and your cell phone (and just about every other digital device in our hands and on our bedside tables), to disruptions in the body's circadian rhythms. Additionally, physicians have identified a relationship between our favorite devices and eye problems, ranging from everyday eye strain to glaucoma to macular degeneration.

Humans can see a thin spectrum of light, visible light, ranging from red to violet. On the far ends are infrared and ultraviolet, which both range outside human vision. Shorter wavelengths appear blue, while the longer ones appear red. What appears as white light, whether it's from sunlight or screen time, actually includes almost every color in the spectrum. In a recent paper published in the journal Scientific Reports, researchers at the University of Toledo have begun to parse the process by which close or prolonged exposure to the 445-nanometer shortwave called "blue light" can trigger damage irreversible damage in eye cells. The results could have profound consequences for consumer technology.

Retinal, a form of vitamin A, is a compound known as a polyene chromophore. It is found in the retina of the eye bound to proteins called opsins, and is the chemical basis of animal vision. If the photoreceptors of the eye are like a vehicle, retinal is the gas. In the lab, we it has been shown that blue light causes the retinal to oxidize, creating toxic chemical compounds. The retinal, energized by this particular band of light, kills the photoreceptor cells, which do not grow back once they are damaged. To take the above analogy further, if retinal is the gas, then blue light is a dangerous spark.

Damaging enough photoreceptor cells can lead to macular degeneration, an incurable disease that blurs or even eliminates vision. Although blue light occurs naturally in sunlight, which also contains other forms of visible light and ultraviolet and infrared rays, we don't spend that much time staring at the sun. As kids, most of us were taught it would fry our eyes. Digital devices, however, pose a bigger threat. The average American spends almost 11 hours a day in front of some type of screen, according to a 2016 Nielsen poll. Right now, reading this, you're probably mainlining blue light.
When we stare straight at our screens, especially in the dark, we channel the light into a very small area inside our eyeball. which can actually intensify the light emitted from the device many many times. It's similar to taking a magnifying glass and holding it to the sun creating a very focused beam of light which has a lot of energy.

Blue light has become "the color of the future," thanks in part to films like 1982's Blade Runner. The environmentally-motivated switch from incandescent light bulbs to high-efficiency (and high-wattage) LED bulbs further pushed us into blue light's path. But, pop culture, which has helped lead us into a blue-lit reality that's hurting us so much, it can help lead us toward a new design aesthetic bathed in orange. The military uses red or orange light for many of its interfaces, including those in control rooms and cockpits since they're low-impact colors that are great for nighttime shifts. They also eliminate blue light-induced "visual artifacts", the sensation of being blinded by a bright screen in the dark, that often accompany blue light and can be hazardous in some scenarios.

Apple offers a "night shift" setting on its phones, which allow users to blot out the blue and filter their screens through a sunset hue. Aftermarket products designed to control the influx of blue light into our irises are also available, including desktop screen protectors. There are even blue light-filtering sunglasses marketed to specifically to gamers. But as the damage done by blue light becomes clearer, just as our vision is getting blurrier, consumers should demand bigger changes.