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Perspectives

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Title: East River Reflections, New York City. The glassy undulating surface of water is a nonstop, delightful, and hypnotic visual display. Ignoring hydrodynamic complexities, the mosaic of shapes and colors (blues, greens, blacks, whites, browns, and sometimes red and yellow) results from the physical/geometric optics and chemical physics of the water and surrounding environment. With the caveat that color is subjective sensation of an intrinsic property of radiation, not matter, the "color of water" perceived by a given observer at a point in space and time is determined by upwelling light from beneath the surface, reflected skylight, and the light scattered by the intervening air, collectively involving absorption, refraction, reflection, and scattering. More specifically, the resulting appearance of the water is influenced by sunlight/cloud coverage, sediment/clarity, bubbles, depth, bottom vegetation, the viewing angle, and whether the water is calm or ruffled by waves. Waves can create 2 reflecting surfaces, 1 tilting toward the observer and 1 away. Water is more reflective the more glancing the angle of observation, so the surface tilting away is more reflective than the toward-tilting surface, thus, the alternating lighter and darker regions. One of water's unique properties is that its intrinsic blueness results from atomic (ie, internuclear) vibrational transitions while most or all other blue substances owe their color to electronic transitions. In his delightful book *Clouds in a Glass of Beer*, Dr. Craig F. Bohren writes that "The world was not designed for the convenience of those who frame multiple choice questions." Undoubtedly true, unless there are numerous choices including "All of the Above."

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