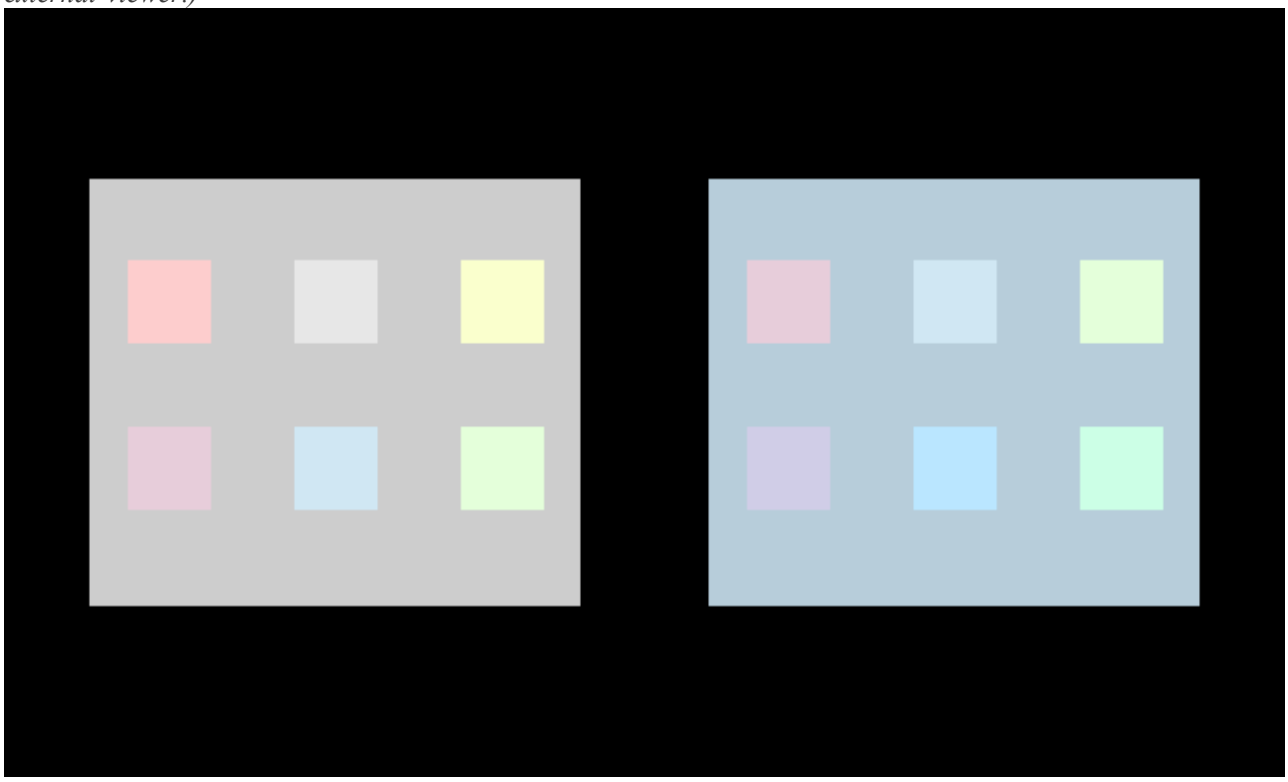
# Color Constancy

Our color vision is based on signals of the the three photoreceptor types which respond to light of three different wavelength regions. But if we look at an object, its color that we perceive is not only determined by the spectral composition of the light coming from the object. Object colors depend on the context in which the object is seen.
Look at the image below. On the left are six color fields on a grey field, representing six objects on a background. On the right, esentially the same arrrangement is shown, but all colors have a slightly bluish tint. It is as if we see the same scene under a bluish illumination. Incidentally, the spectral composition of the light coming from the three fields in **the upper row on the right side** are **exactly the same** as those of **the lower row on the left side**. Furthermore, the colors on the right that match most closely those on the left are the ones in the corresponding positions of the scenes, not those with the same physical spectrum:

*(Note: The important colors differences in this image are small. Some browsers mess up the colors so that the image doesn't make much sense any more (For example, there should be a slight color difference between the two gray background fields). If the colors you see don't seem to match the description above, you can try a dithered version of the image , or, view the image with an external viewer.)*



- Lights of the same spectral composition can be perceived as different colors.
- The same color appearance can result from lights with different spectra.

Doesn't that sound like non-constancy, rather than constancy?
Under different illumination, the spectrum of the light coming from an object is different. Therefore it is not possible to recognize an object by analyzing only its spectrum. A **less variable** feature of an object is its **reflectance**. The object colors that we see probably correspond more to the reflecting properties of the objects than to the light reflected at a certain moment. As in other tasks, in color vision our visual system tries to extract invariant object properties from varying physical quantities.
I am currently trying to better understand what the mechanisms are that our brain uses to figure out how to separate and discount spectral properties of the illumination from surface reflectances of objects.

**Publications:**

Wachtler, T, Albright, TD, and Sejnowski, TJ (1998) Non-local Color Induction Under Changing Adaptation Depends on Chromatic Contrast. *Soc. Neurosci. Abstr.* 24(2):1398 Abstract

Wachtler, T, Sejnowski, TJ, and Albright, TD (1998) Integration of Colour Information Across the Visual Field. *European Journal of Neuroscience* 10(10) supplement:251 Abstract

Wachtler, T, Albright, TD, and Sejnowski, TJ (1997) Nonlinear Spatial Induction of Color Changes *Optics & Photonics News* 8(8) supplement:131 50-word Abstract

Wachtler, T, Albright, TD, and Sejnowski, TJ (1997) Spatial Interactions in Color Perception *Invest. Ophth. & Visual Science* 38(4):898 Abstract

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