Light and the Red Shift

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Consider the Red-shift as the observation which precipitated the Big Bang Theory of the origin of the Universe. In simple terms, astronomers searching the sky found white stars and stars with a red tint. Explaining the phenomenon was complicated by the fact that light travels at a constant speed in a vacuum such as outer space. It was the wave properties of light that gave us an explanation. Each color of light has its own specific wavelength, or the length from one peak of the oscillation to the next. While the speed of the light itself did not change, objects travelling away from us at high rates of speed would have their wavelengths stretched. In that manner, light emitted as white light from a fast-moving object would be observed as a reddish light from a stationary observor, provided the emitter was moving away from the observor.

Theoretically, however, if the observor were in the path of the fast-moving emitter, the object would appear blue or violet in color because the wavelength would be compressed.

Red-shifted objects are common. Blue-shifted objects are unheard of.

Now consider the same scenario while including the theory of physical relativity.

In the vacuum of space, there is an observor and an emitter. The emitting object is seen by the observor as a white light. As the object moves away from the observor, the wavelength shifts to red. Should that object also increase in speed, the wavelength is stretched further. Should the object actually reach the speed of light, the wavelength becomes infinitely long and the object disappears; The observor can no longer see it.

The relationship between the emitting object and the emitted light changes at the point that the object exceeds the speed of light. In that scenario, the object is travelling faster than the speed of light and emitting light, travelling at the speed of light. Relative to the observor, the light then is no longer originating from the object, but appears to arrive at the observor from the opposite direction, 180 degrees relative to the actual object. The observor would see a red-shifted object going away from the observor, but in the opposite direction of the actual emitting object.