What is Selective-Yellow Light?

It's what happens when you subtract blue from an auto headlamp: Blue is the shortest wavelength and, as such, scatters the most readily. (To prove this to yourself, find a dark blue store front sign or something else that's a dark, pure blue against a dark background in the absence of white light. From any appreciable distance, it's almost impossible for your eyes to see the blue lighted object as a sharply defined form...the edges blur significantly.)

When blue light strikes water (rain, fog, snow) it scatters in all directions and makes on-road vision very difficult.

Blue also is a very difficult color of light to look at if it is at all intense...it stimulates the reaction we call "glare".

So the French figured to remove the blue from the output spectrum of their vehicles' front lamps. White light with the blue component subtracted is known as "selective yellow" light. It is a pure yellow color with little or no orange component--hence the French yellow headlamps. There haven't been any recent comparative studies. Yellow lamps were subjectively ranked as better in poor weather and lower in glare than white ones, and this matches my own experimental experience with fog lamps that produce yellow light. But is the effect real or just an illusion?

One problem with this conclusion as drawn from the French experience with selective-yellow headlamps in France is that when the question was being considered, the lamps that were being compared with white lamps reduced the absolute intensity of the beam by about 12 percent. This fact may have had a part in reducing the glare. Because the requirement for yellow light no longer exists (though such light is optional in many countries) we probably will never know the vagaries of the answer to this question.

A good fog lamp has almost no upward light and a very sharp cutoff. (And a well-placed fog lamp is mounted low to the ground, to maximize vertical separation between the driver's eyes and the cutoff of the beam pattern, thus throwing light "under" the fog blanket from the driver's perspective.) Now, selective-yellow light is, subjectively, a better color for a fog lamp because the main part of the beam (below the cutoff) creates the effect of less-glaring backdazzle. The only condition under which selective-yellow light (or any kind of yellow light, for that matter) has actual, physically greater penetration power is in what is called "blue fog", in which the water droplets are many, many times smaller than the droplet size found in common atmospheric fog. A fog lamp is not defined as "yellow", but as a lamp that produces a very wide bar of light with minimal-to-no uplight and a sharp horizontal cutoff, and the determinant of a good fog lamp is amount of uplight (less is better) and sharpness of cutoff (sharper is better), not beam color. Selective-yellow light can improve fog lamp performance,

because it is lacking in the high frequency/short wavelength blue light that reflects readily off atmospheric moisture (frozen or not) and into your eyes. I prefer selective-yellow fog lamps, though I would certainly take a good white fog lamp over a poor selective-yellow one. (My preference is for good selective-yellow ones!).

Modern methods of obtaining selective-yellow light, such as the placement of a yellow-pass dichroic filter on the bulb envelope, on the reflector or on the lens, can create more problems than they solve. The blue-appearing lenses in many Asian-made fog lamps ("ion crystal", "gold irridium", and other nonsensical marketing names) are coated with a multilayer dichroic interference coating which passes selective-yellow light "on axis", which means "straight ahead". Unfortunately, these coatings tend to glow blue when viewed off-axis, which has caused problems with people getting pulled over for illegal "blue" lights 'cause the cop sees blue.

Many lamps involving dichroic filter coatings on the bulb, reflector or lens tend to create "blue haze" above the beam cutoff or, in the case of a driving or SAE headlamp beam, scattered throughout the beam. That's because of the irridescence of these coatings, which causes or aggravates secondary-reflection problems where none would exist absent the coating. With the mirrorlike dichroic coating reflecting images of the glowing filament, light gets where it doesn't belong. None of these effects help the performance of your lamps at all! Headlamps should be white, and it is best to stick with regular, clear bulbs! Blue light is NEVER used in performance halogen lighting, ONLY in poseur items.

What about these various methods of getting selective-yellow light? Until the mid 1990s, headlamps in France were required to produce yellow light. This was accomplished in one of several ways: With a headlamp lens made out of yellow glass, with a yellow glass balloon in front of the bulb either as part of the bulb or as part of the lamp unit, or, more recently, with a yellow-pass dichroic filter coating on halogen bulbs. When we talk about light color in an automotive context, we need to address the question of legality.

Under US Federal Motor Vehicle Safety Standard number 108 and Canadian Motor Vehicle Standards 108 and 108.1, headlamps as originally installed on motor vehicles (and as installed by anyone other than the vehicle owner) must produce white light.

Let's stop there for a moment. What is "White"? FMVSS108 contains a reference to an SAE standard that defines "white" light in terms of wavelengths. But it's not just one set color. The standard includes a wavelength aggregate RANGE that is considered "white". That's why arc-discharge headlamps, with their decidedly bluish cast, still are considered "white". It's why "blue ion" or "crystal blue" bulbs with blue-pass dichroic filters sold to poseurs who want to try to pretend they have arc-discharge lamps are NOT considered "white". To read all about blue light, click here But more relevant to this discussion, the light can tend towards a yellow tint to a certain degree and still qualify as acceptable "white" light. Osram, Narva, Philips and other established European bulbmakers have been offering partial-tint selective-yellow bulbs alongside their ranges of clear/white bulbs and full-tint selective-yellow bulbs for some time now in Europe. Such bulbs are beginning to appear in bulb formats used in many US headlamps. Philips North America, for instance, is marketing a line of bulbs that have a light dichroic filter coating on them to tint the light yellow.

They are sold under the "WeatherVision" name. Such bulbs can, in certain kinds of headlamps and under certain atmospheric conditions, subjectively improve poor-weather visibility. There is no concrete physical improvement, though, in most conditions, and most headlamps create the "blue haze" mentioned above with bulbs like this. The yellow-tinted light doesn't glare as much in rain, fog, or snow, but you don't see as well in good weather.

There also are European-type (H1, H3, H4, etc.) bulbs with a heavier dichroic filter or a yellow glass balloon over them that produces full-tint selective-yellow light. Under FMVSS108, these wouldn't be acceptable.

The laws vary from state to state. New Jersey and several other Eastern Seaboard states allow nothing but DOT-spec white headlamps. Most of the states either don't specify (and hence officially don't care) what sort of headlamp you use, as long as it has a high and a low beam. Most states say either that the headlamps must be "white" or that any lamps facing forward on a car must be "white, yellow, or amber". But white is the correct color for a headlamp.

To guarantee compliance with all laws and not raise the ire of your local police in the US and Canada, headlamps must be white. Auxiliary lamps (fog, driving, etc.) can be either white or selective yellow, though it should be mentioned that there's no reason for a driving lamp to be any color other than white..

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