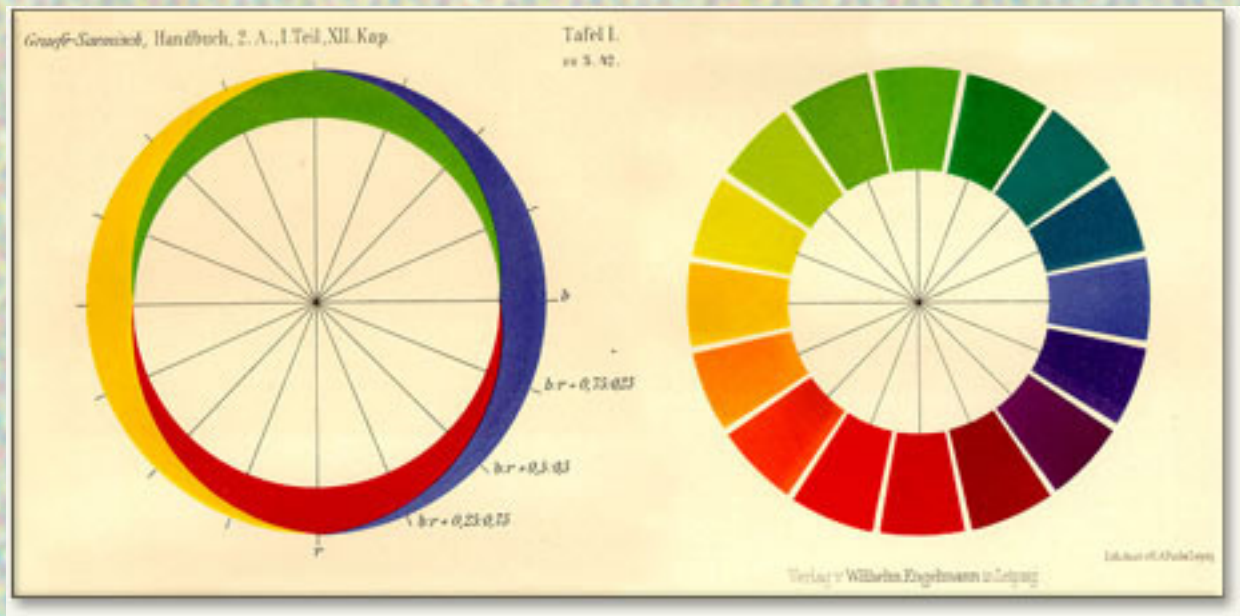
The Nature of Color



Color has 3 aspects:

- Physical – how you see it
- Psychological – the impact it has on you
- Chemical – the actual make up

The Nature of Color:

Perception – how we see it

The relationship between color and light
(ADDITIVE COLOR)

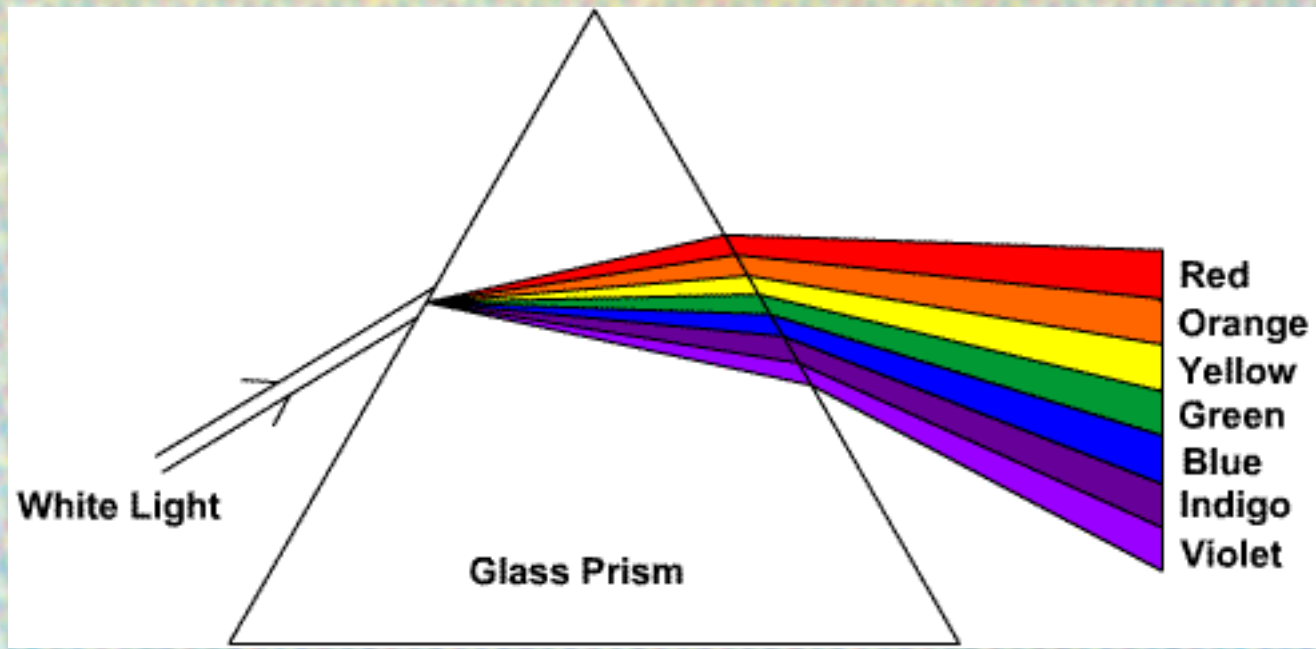
Physically colored objects
(SUBTRACTIVE COLOR)

Color Physics

White light is made of all colors – this can be seen when refracted through a prism

Individual components of white light = HUES

- Issac Newton named 7 hues, known as the spectral or prismatic hues
- You know these as Red, Orange, Yellow, Green, Blue, Indigo, Violet

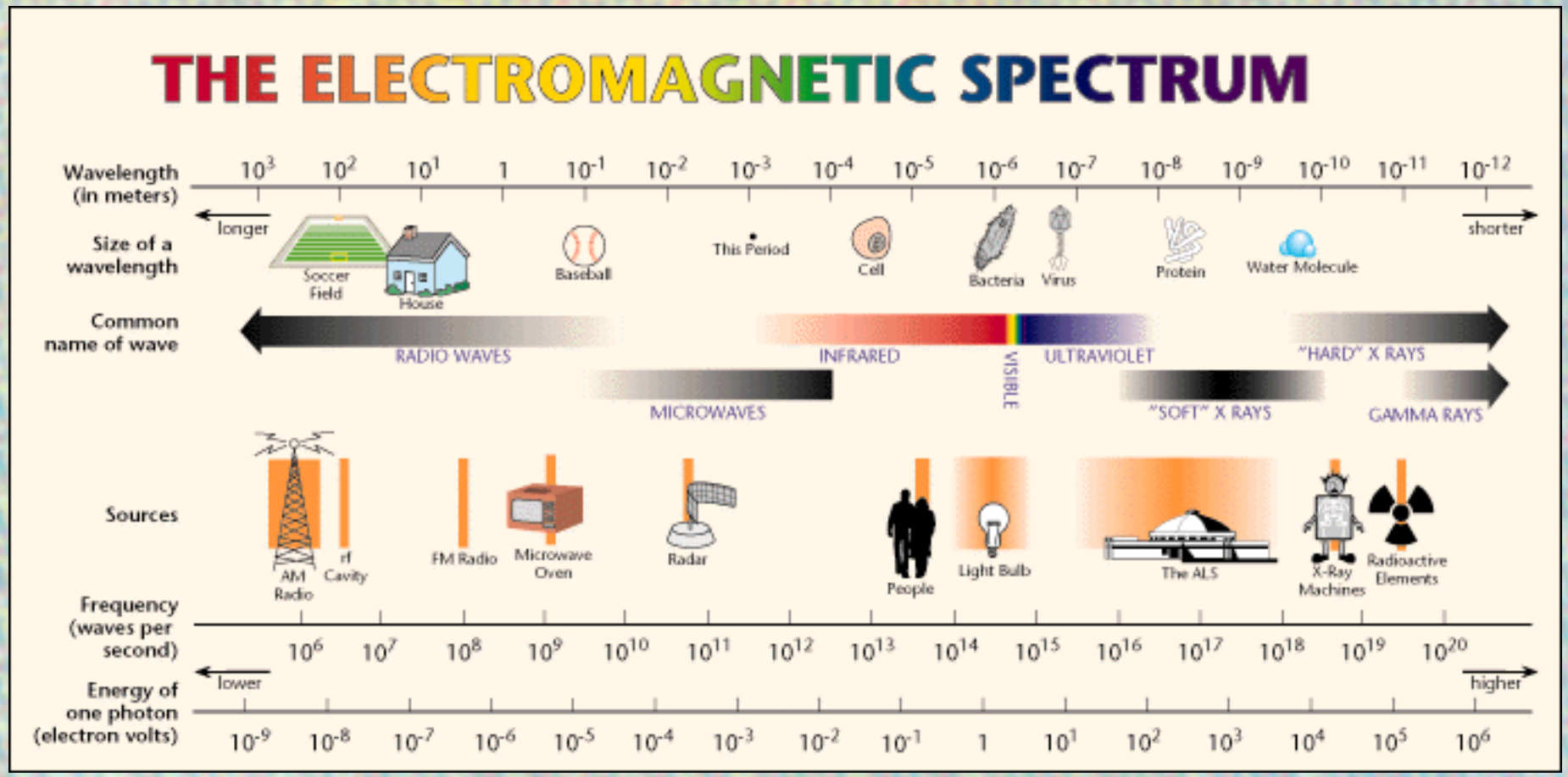


But there's more...

Visual light is only a small part of the electromagnetic spectrum.

Violet is the shortest wavelegnth of visible light

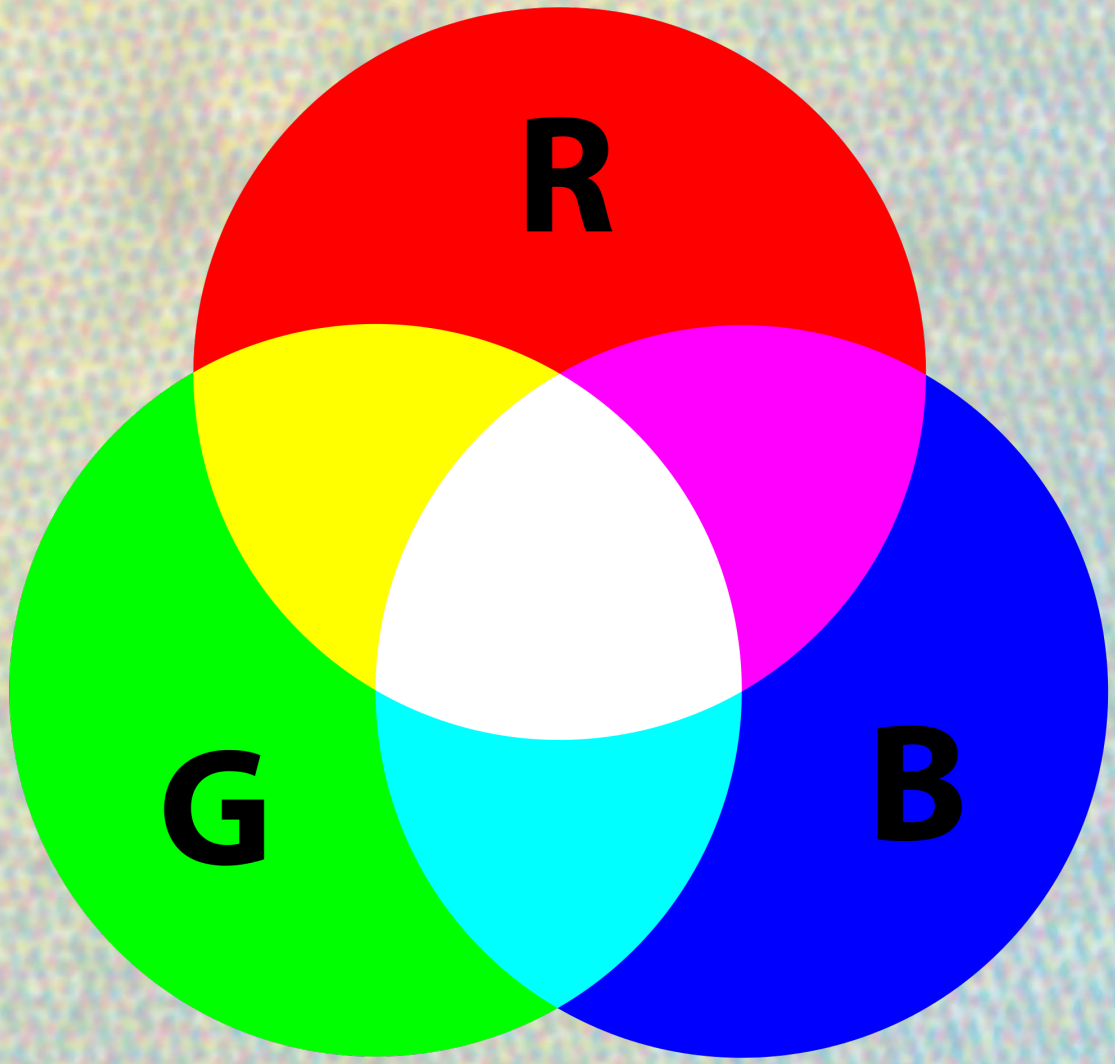
Red is the longest



So, that brings us to white light...

or additive light

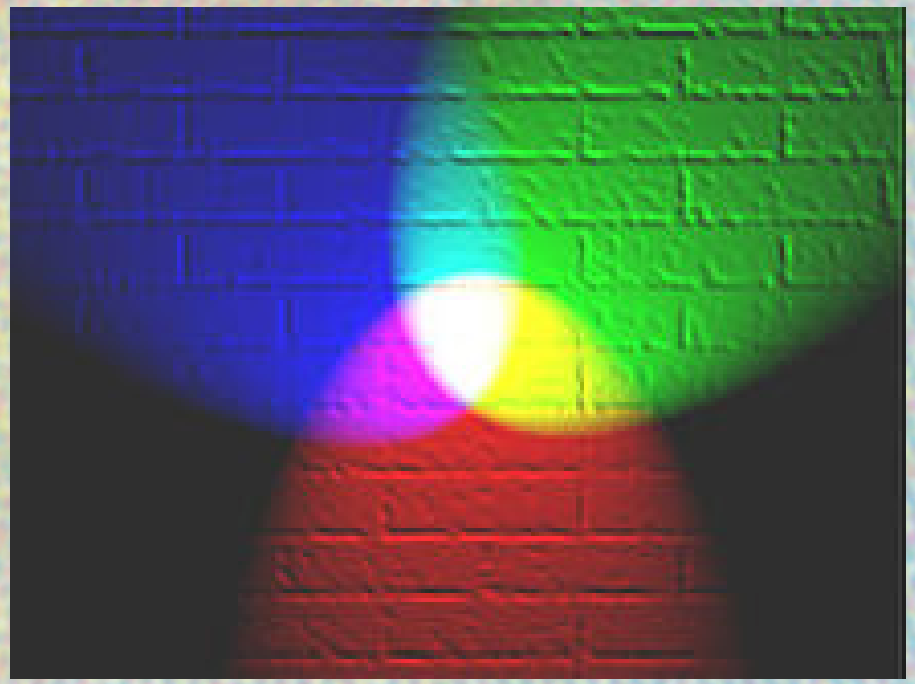
Additive light combines all the primaries to create white light



Additive Color...continued

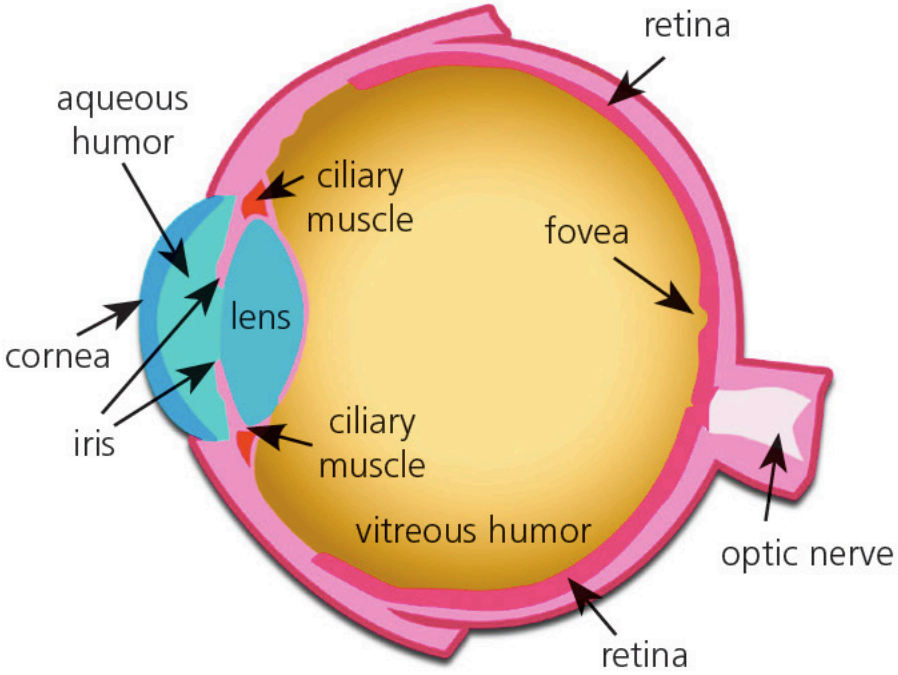
The primaries of additive color are Red, Green, and Blue. You may be familiar with these when it comes to screens around you.

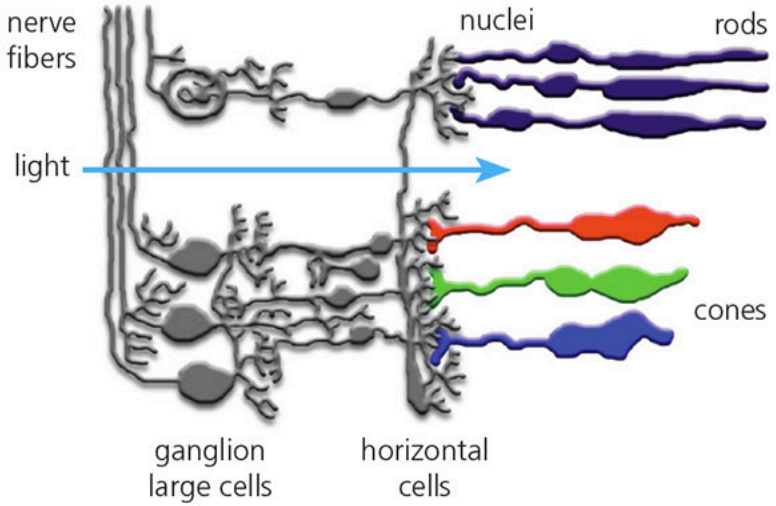
The secondary colors are Yellow, Cyan, and Magenta.



White light relates to our eyes

The primary colors relate directly to the rods and cones in your eyes that percieve color.



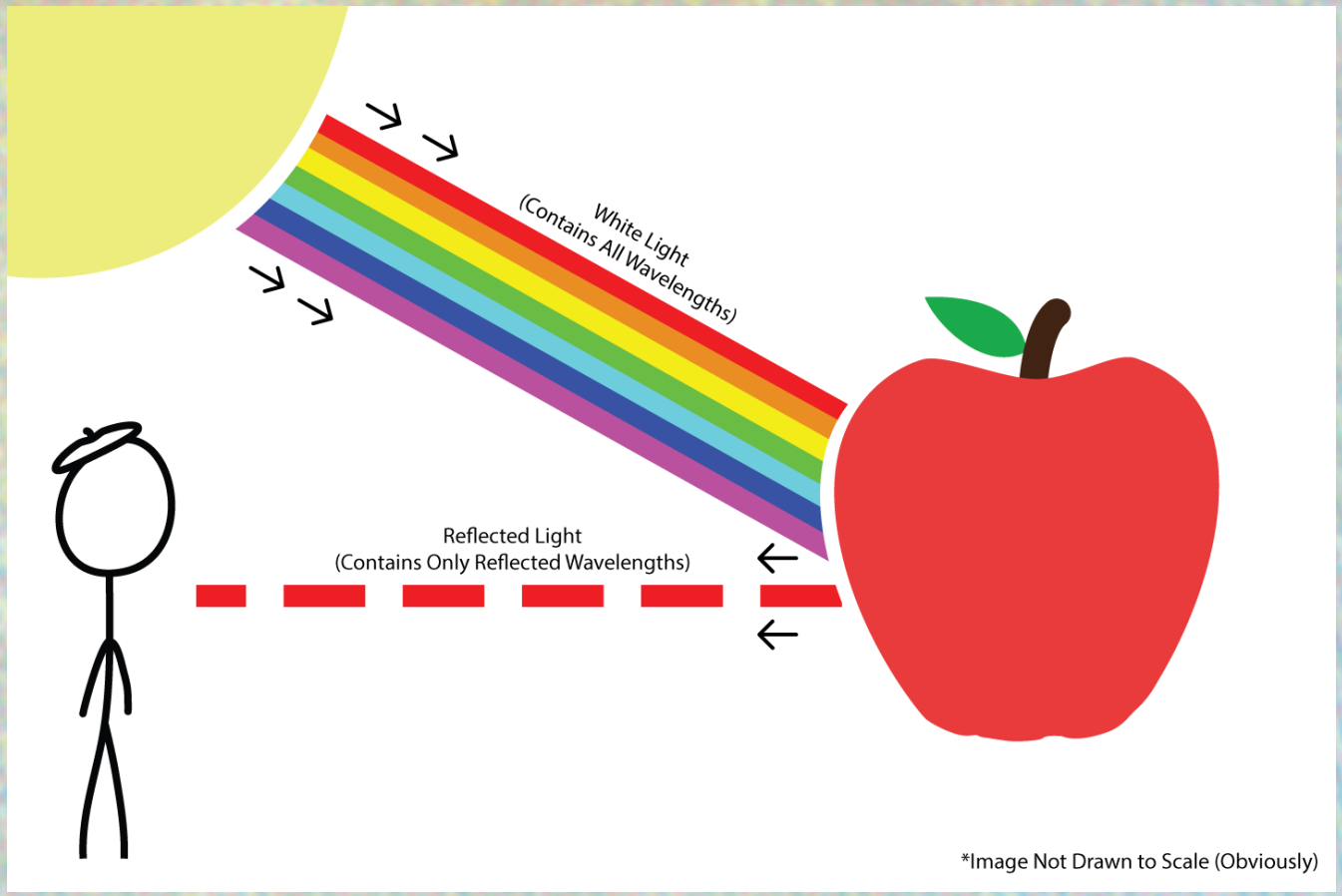


So, how does this work?

You see color when white light bounces off objects. An object will absorb come of the wavelengths of visible light and what is left over is reflected back to you.

That reflection is what your eyes convert to color in your brain.

This kind of makes color an illusion we all believe in.



Factors that affect color perception:

1. Amount of light present
2. Quality of light present
3. Visual health
4. Surface of the object
5. Surroundings

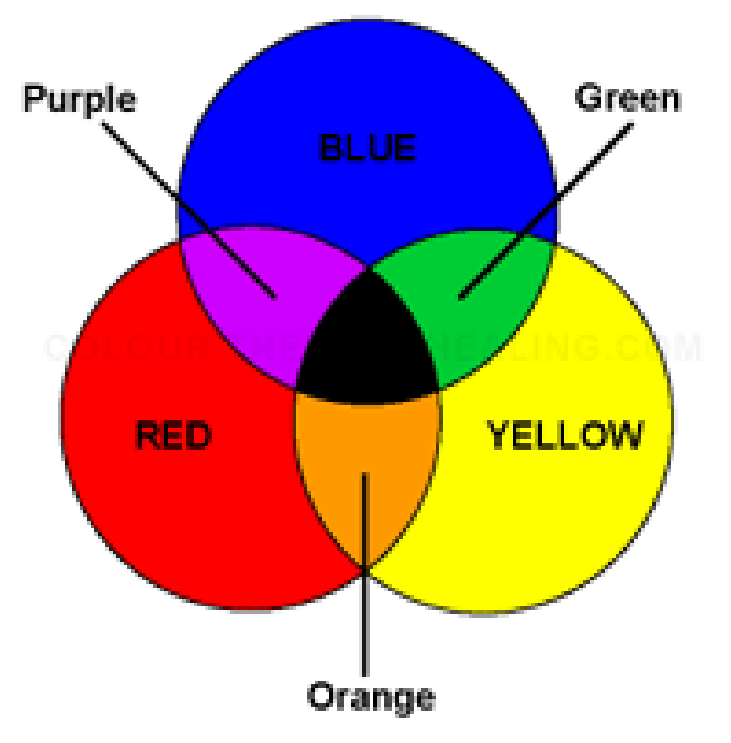
But, that's not what you have always used in art class.

That was the subtractive color wheel

Subtractive color

Primary colors are Red (magenta), Yellow, Blue (cyan)

These are second-hand colors...because you only see them after reflection



It is the inverse of the additive color wheel

But...

does that mean that paint isn't really colored?

It isn't, it has just been mixed to reflect certain wavelengths of light

Your whole life is a lie.

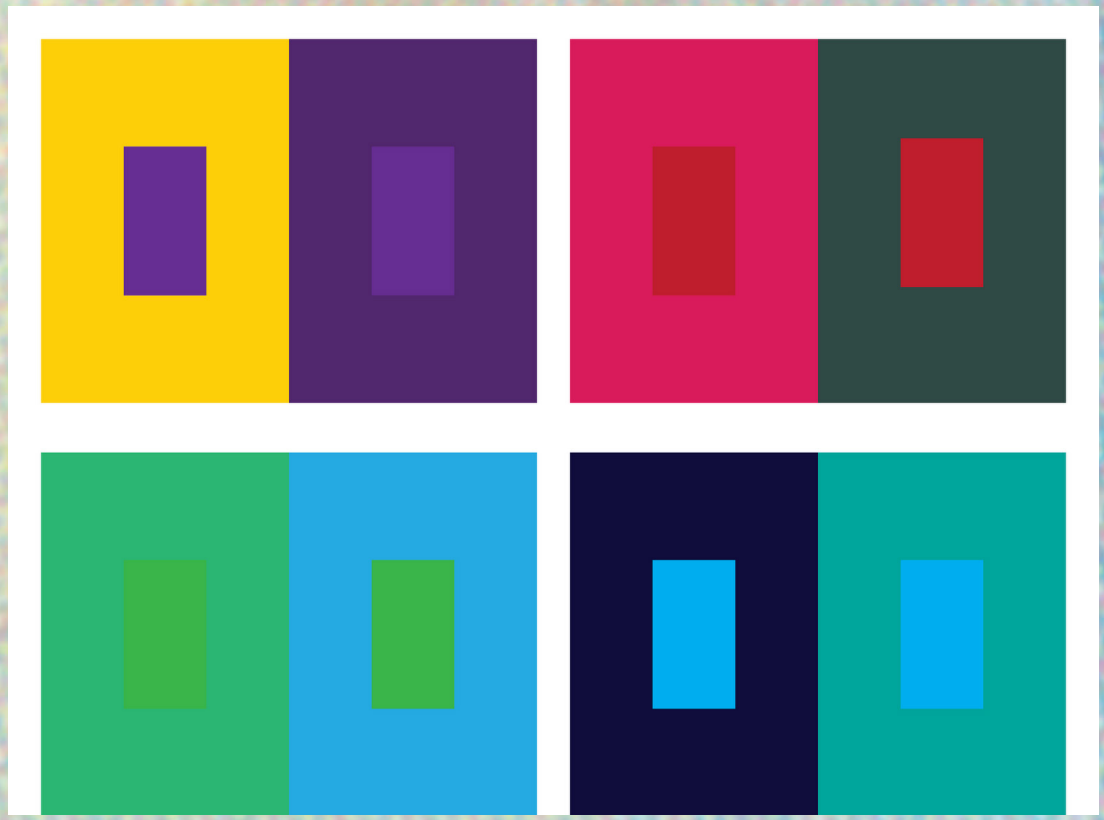
More subtractive color stuff.

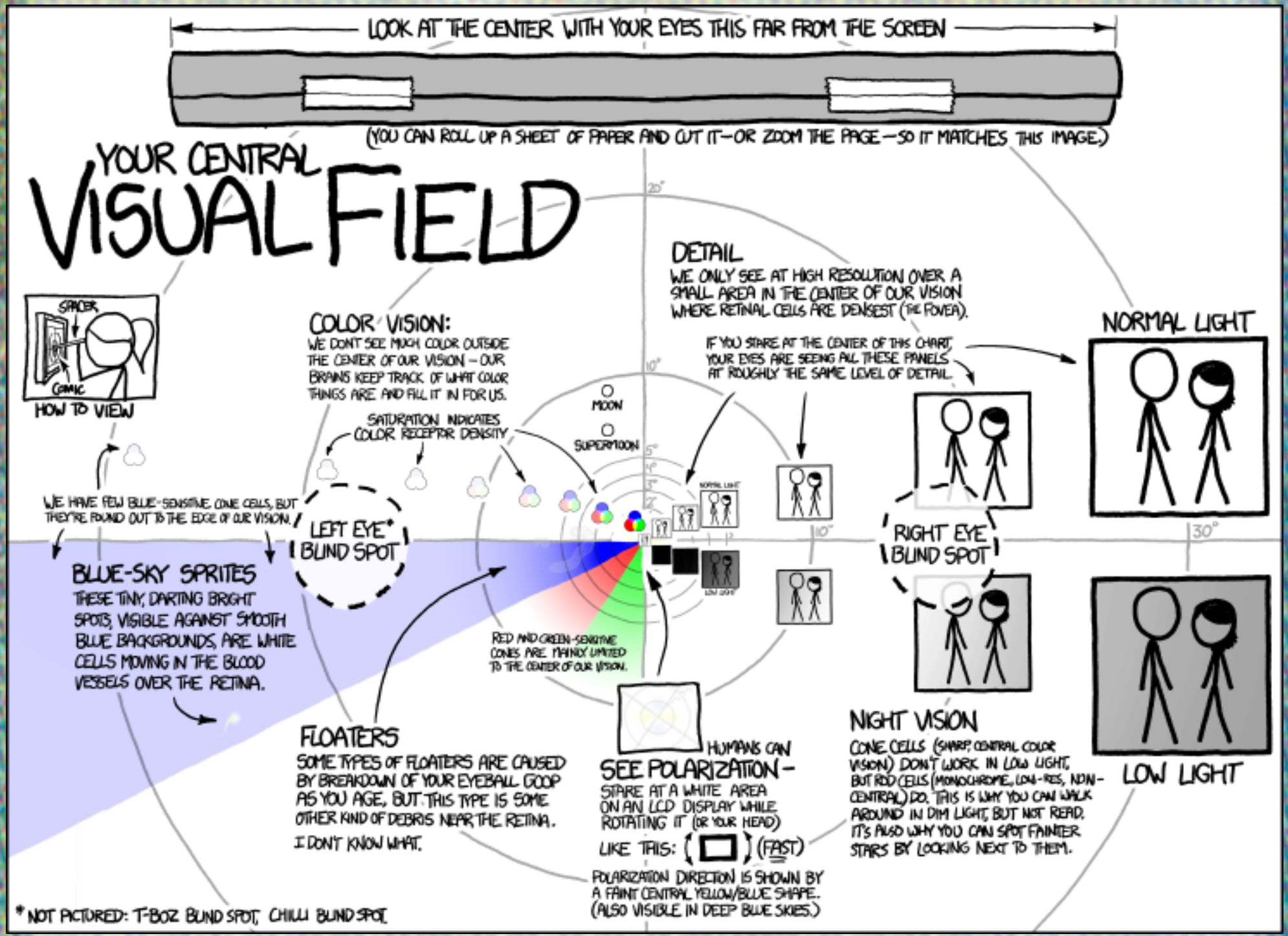
When colors are mixed together, they lose intensity because the wavelegnths are decreased or subtracted. The colors cancel each other out to create mud.

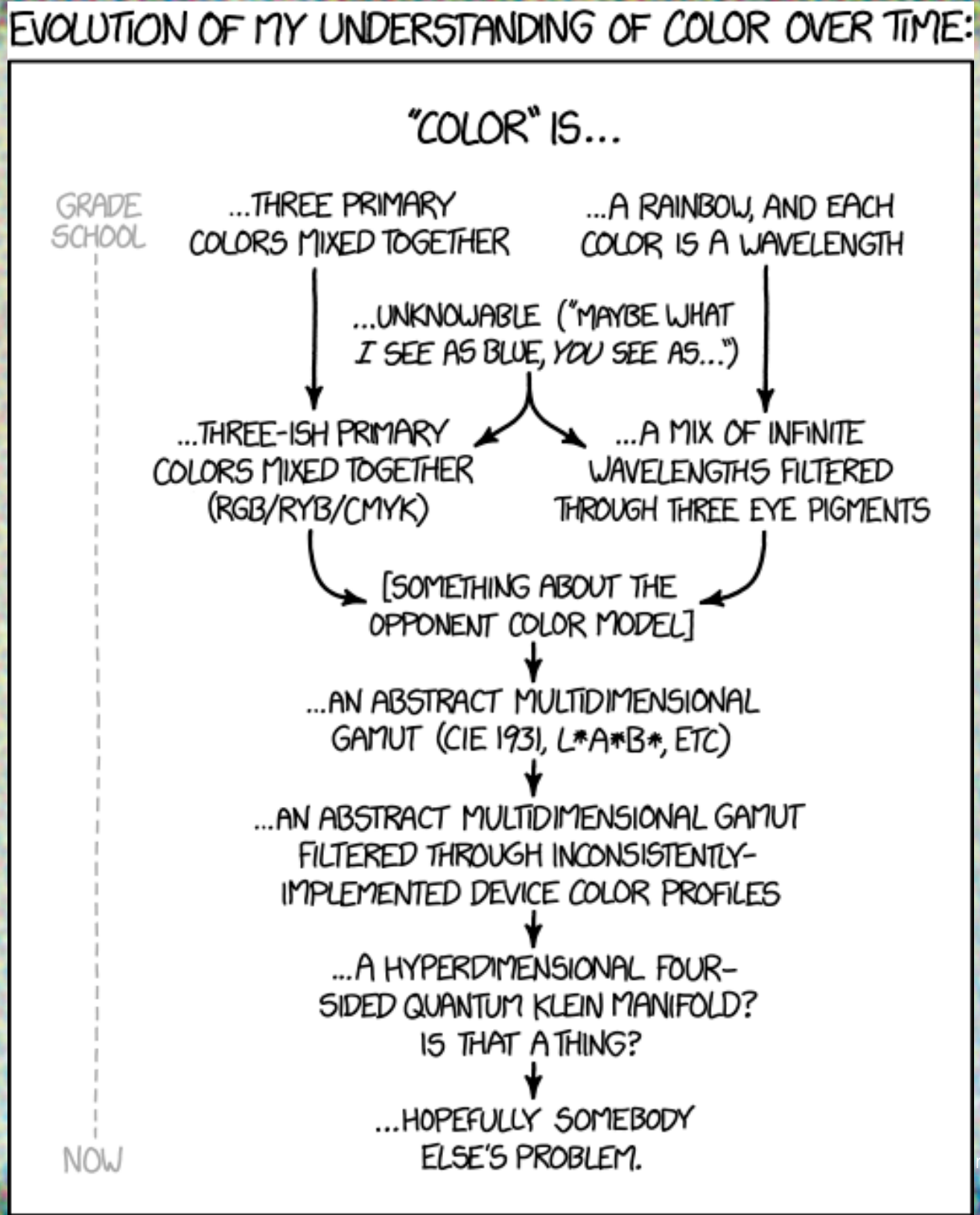
And that leaves us with local vs. relative color

Local color is what we percieve an object to be
made of different shades
affected by lighting & surface

Relative color refers to a color's ability to change based on it's surroundings.




LOOK AT THE CENTER WITH YOUR EYES THIS FAR FROM THE SCREEN
(YOU CAN ROLL UP A SHEET OF PAPER AND CUT IT—OR ZOOM THE PAGE—SO IT MATCHES THIS IMAGE.)
YOUR CENTRAL
VISUAL FIELD
SPACER
COMIC
HOW TO VIEW
COLOR VISION:
WE DON'T SEE MUCH COLOR OUTSIDE THE CENTER OF OUR VISION — OUR BRAINS KEEP TRACK OF WHAT COLOR THINGS ARE AND FILL IT IN FOR US.
SATURATION INDICATES COLOR RECEPTOR DENSITY
MOON
SUPERMOON
DETAIL
WE ONLY SEE AT HIGH RESOLUTION OVER A SMALL AREA IN THE CENTER OF OUR VISION WHERE RETINAL CELLS ARE DENSEST (THE FOVEA).
IF YOU STARE AT THE CENTER OF THIS CHART, YOUR EYES ARE SEEING ALL THESE PANELS AT ROUGHLY THE SAME LEVEL OF DETAIL.
NORMAL LIGHT
WE HAVE FEW BLUE-SENSITIVE CONE CELLS, BUT THEY'RE FOUND OUT TO THE EDGE OF OUR VISION.
LEFT EYE* BLIND SPOT
RIGHT EYE BLIND SPOT
BLUE-SKY SPRITES
THESE TINY, DARTING BRIGHT SPOTS, VISIBLE AGAINST SMOOTH BLUE BACKGROUNDS, ARE WHITE CELLS MOVING IN THE BLOOD VESSELS OVER THE RETINA.
RED AND GREEN-SENSITIVE CONES ARE MAINLY LIMITED TO THE CENTER OF OUR VISION.
FLOATERS
SOME TYPES OF FLOATERS ARE CAUSED BY BREAKDOWN OF YOUR EYEBALL GOOP AS YOU AGE, BUT THIS TYPE IS SOME OTHER KIND OF DEBRIS NEAR THE RETINA.
I DON'T KNOW WHAT.
HUMANS CAN SEE POLARIZATION—
STARE AT A WHITE AREA ON AN LCD DISPLAY WHILE ROTATING IT (OR YOUR HEAD)
LIKE THIS: (FAST)
POLARIZATION DIRECTION IS SHOWN BY A FAINT CENTRAL YELLOW/BLUE SHAPE. (ALSO VISIBLE IN DEEP BLUE SKIES.)
NIGHT VISION
CONE CELLS (SHARP, CENTRAL COLOR VISION) DON'T WORK IN LOW LIGHT, BUT ROD CELLS (MONOCHROME, LOW-RES, NON-CENTRAL) DO. THIS IS WHY YOU CAN WALK AROUND IN DIM LIGHT, BUT NOT READ. IT'S ALSO WHY YOU CAN SPOT FAINTER STARS BY LOOKING NEXT TO THEM.
LOW LIGHT
* NOT PICTURED: T-BOZ BLIND SPOT, CHILLI BLIND SPOT


EVOLUTION OF MY UNDERSTANDING OF COLOR OVER TIME:
"COLOR" IS...
GRADE SCHOOL
...THREE PRIMARY COLORS MIXED TOGETHER
...A RAINBOW, AND EACH COLOR IS A WAVELENGTH
...UNKNOWABLE ("MAYBE WHAT I SEE AS BLUE, YOU SEE AS...")
...THREE-ISH PRIMARY COLORS MIXED TOGETHER (RGB/RYB/CMYK)
...A MIX OF INFINITE WAVELENGTHS FILTERED THROUGH THREE EYE PIGMENTS
[SOMETHING ABOUT THE OPPONENT COLOR MODEL]
...AN ABSTRACT MULTIDIMENSIONAL GAMUT (CIE 1931, L*A*B*, ETC)
...AN ABSTRACT MULTIDIMENSIONAL GAMUT FILTERED THROUGH INCONSISTENTLY-IMPLEMENTED DEVICE COLOR PROFILES
...A HYPERDIMENSIONAL FOUR-SIDED QUANTUM KLEIN MANIFOLD? IS THAT A THING?
...HOPEFULLY SOMEBODY ELSE'S PROBLEM.
NOW