


TIM S. KANG

HUSBAND, DAD, CINEMATOGRAPHER

PRINCIPAL ENGINEER, COLOR & IMAGING // CINEMATOGRAPHER —  QUASAR SCIENCE

FOUNDER & CHAIR — LIGHTING COMMITTEE, ASC MOTION IMAGING TECHNOLOGY COUNCIL

Education

MFA – Cinematography, American Film Institute Conservatory

BS – Biomedical Engineering, Johns Hopkins University



SSI APPLICATIONS FOR *CINEMATOGRAPHERS & GAFFERS:*

A tool for lighting control

A tool for lighting color confidence

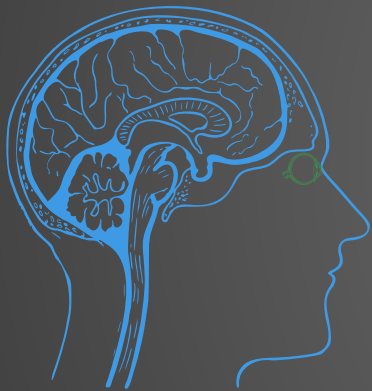


Tim S. Kang — Cinematographer
Principal Engineer, Color & Imaging

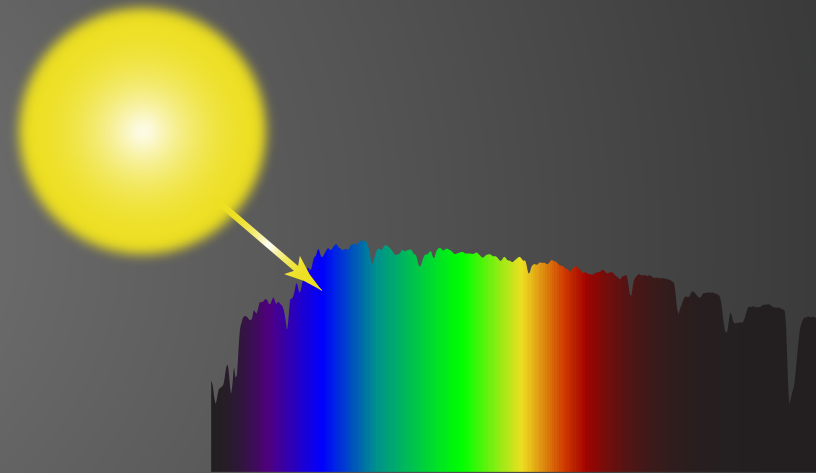
Image credit: Martijn Veltman

What is color science?

Psychophysics



+



Psychology

Physics

Organizing Principle:



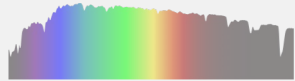
Light

Object

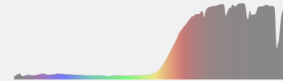
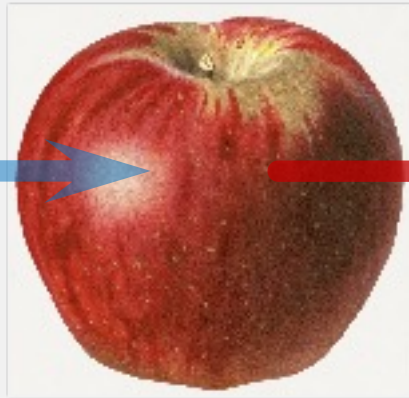
Observer

Radiometry: Spectral Fingerprints

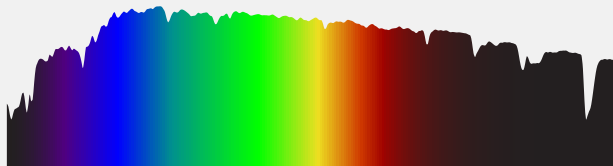
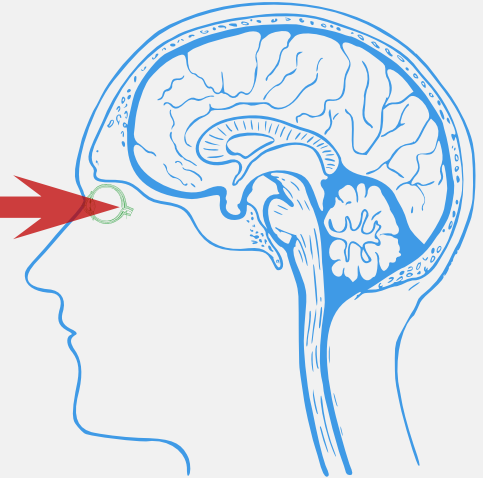
Light



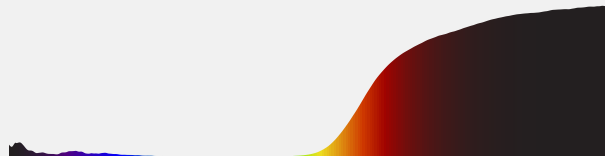
Object



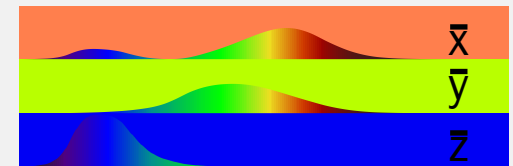
Observer



Spectral Power Distribution



Spectral Reflectance



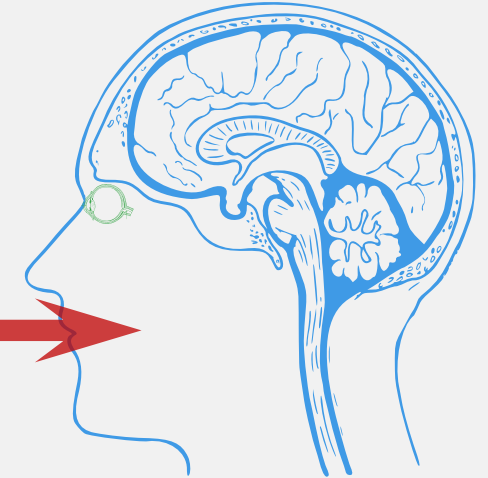
CIE 1931 2° Observer
“Color Matching Functions”

Colorimetry: Psychological Color Models

Display Light



Observer



Real Humans

METAMERISM:

DIFFERENT RADIOMETRY,

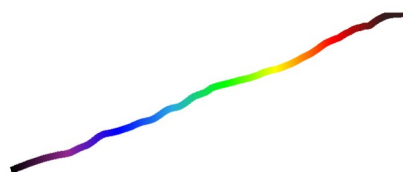
SAME LIGHTING COLORIMETRY...

DIFFERENT CAMERA COLORIMETRY

IDEAL

x: 0.4234
y: 0.3990

3000W Fresnel



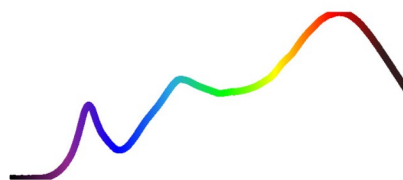
x: 0.4234
y: 0.3990

Typical High Quality 3000K LED



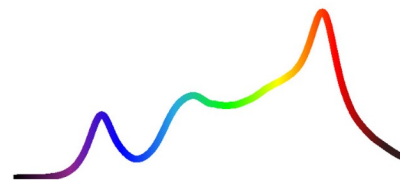
x: 0.4234
y: 0.3990

Typical RGBWW LED @ 3000K



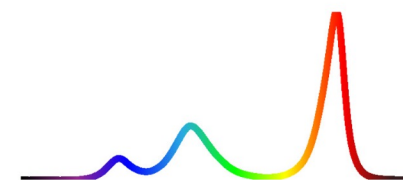
x: 0.4234
y: 0.3990

Typical RGBA LED @ 3000K

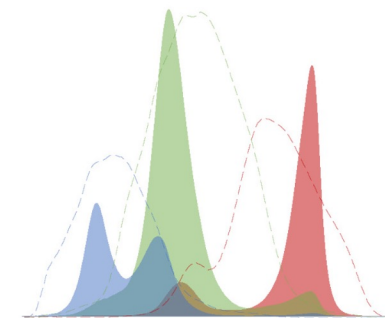
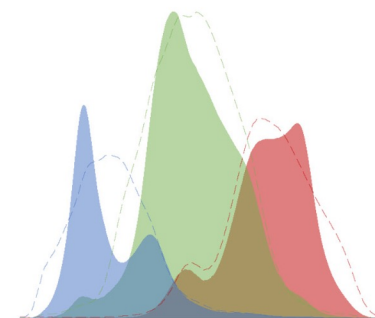
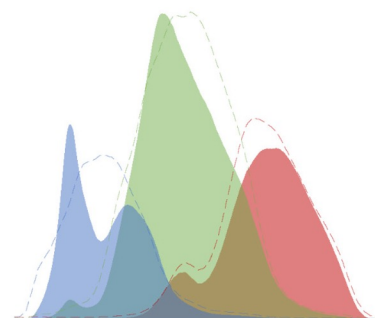
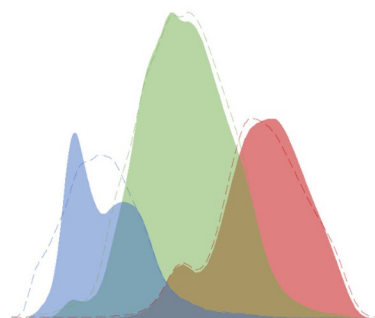
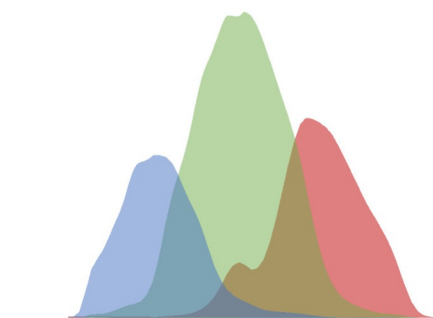


x: 0.4234
y: 0.3990

Typical RGB LED @ 3000K



Camera
Sensor
RAW,
White
Balanced



OUR SCIENCE USE PANELS

1K Fresnel



All **R****G****B** LED diodes only: 3200K







Tungsten



Typical **RGB**
“White”:
3200K 0CC



1K Fresnel

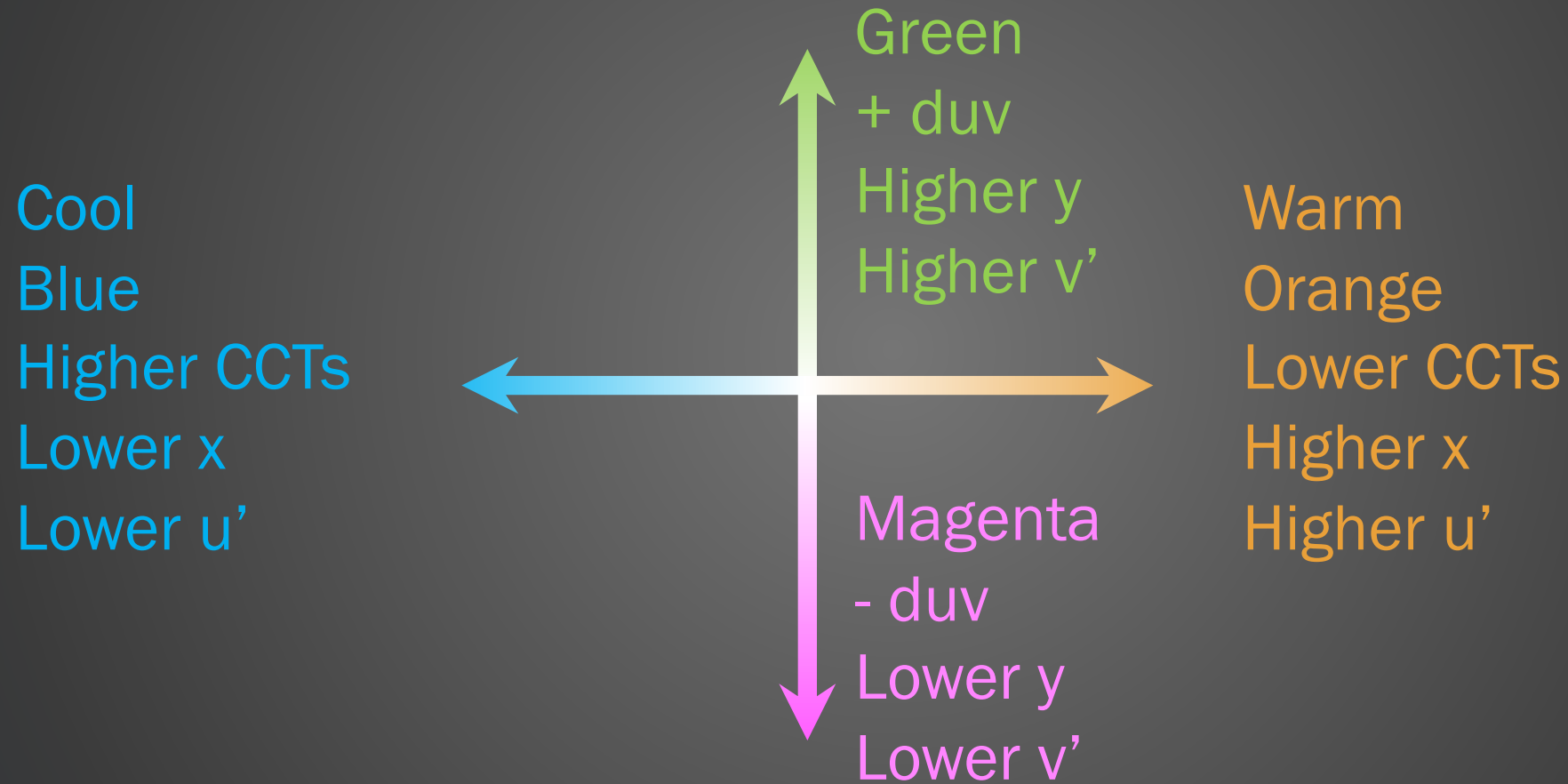


LIGHTING COLOR CONTROL: THE POINT OF ALL OF THIS

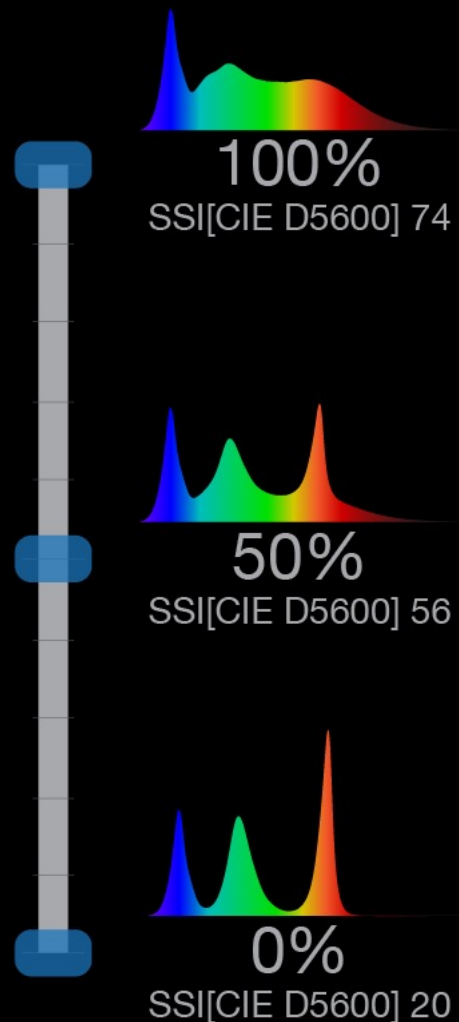


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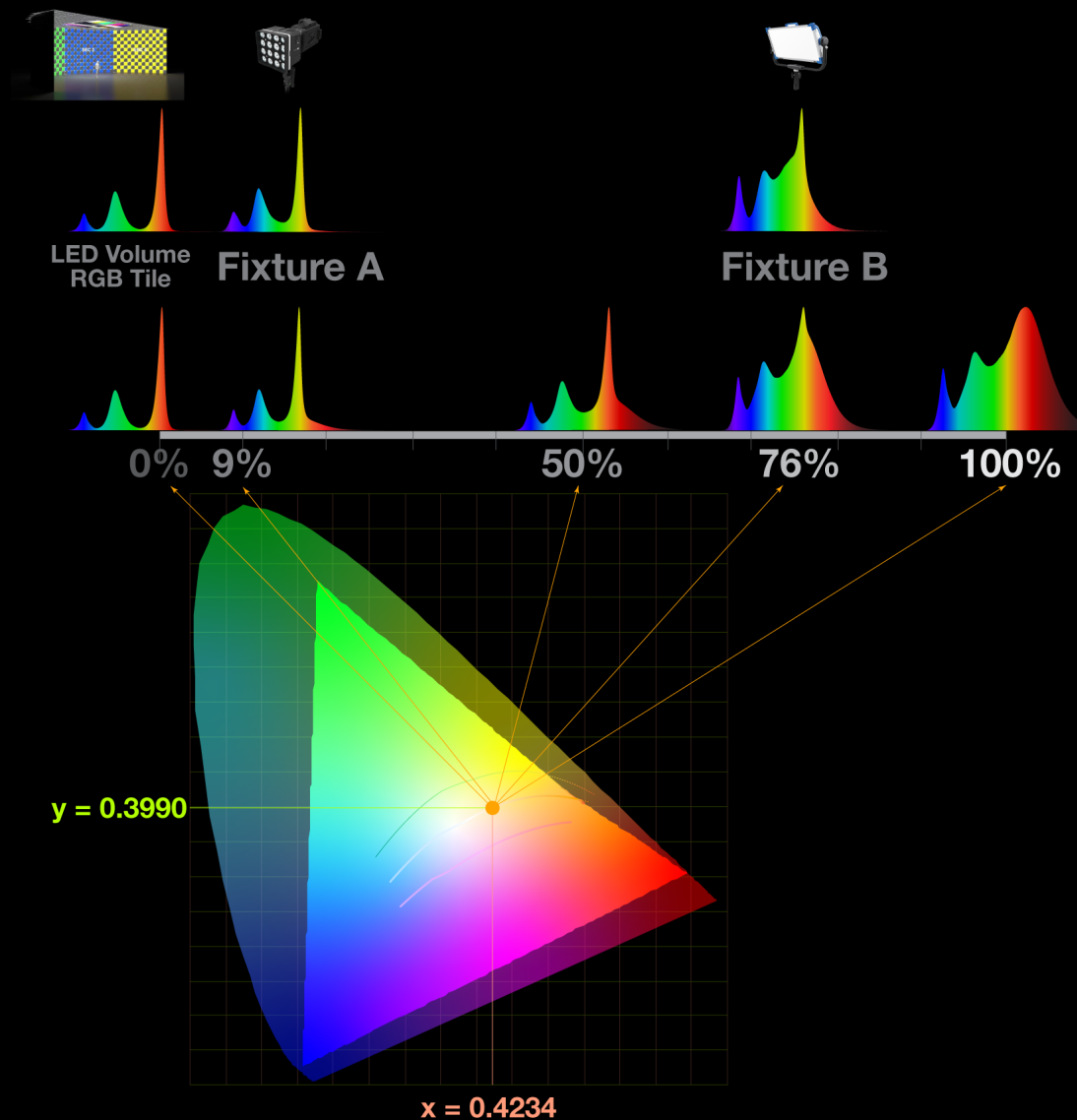
LEGACY COLORIMETRY CONTROL: WHITE LIGHT



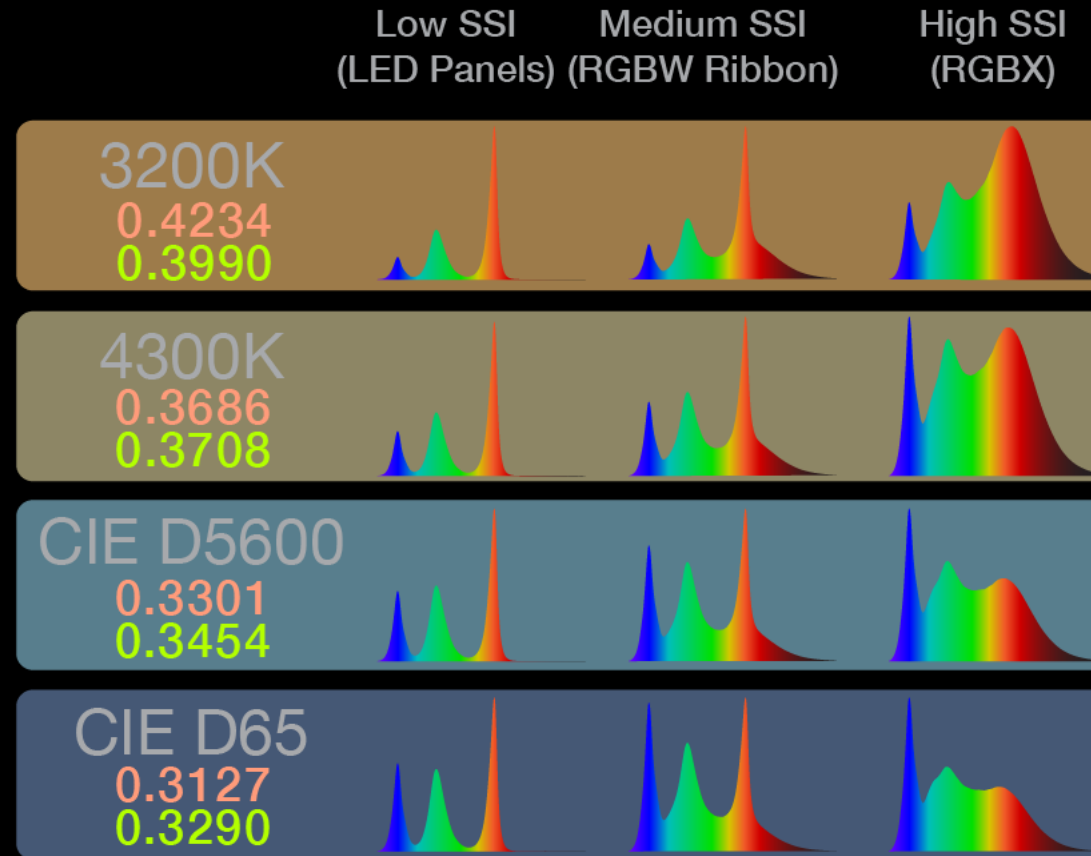
Radiometric Control



Spectrum match @ 3200K, 0 duv



Radiometric Control



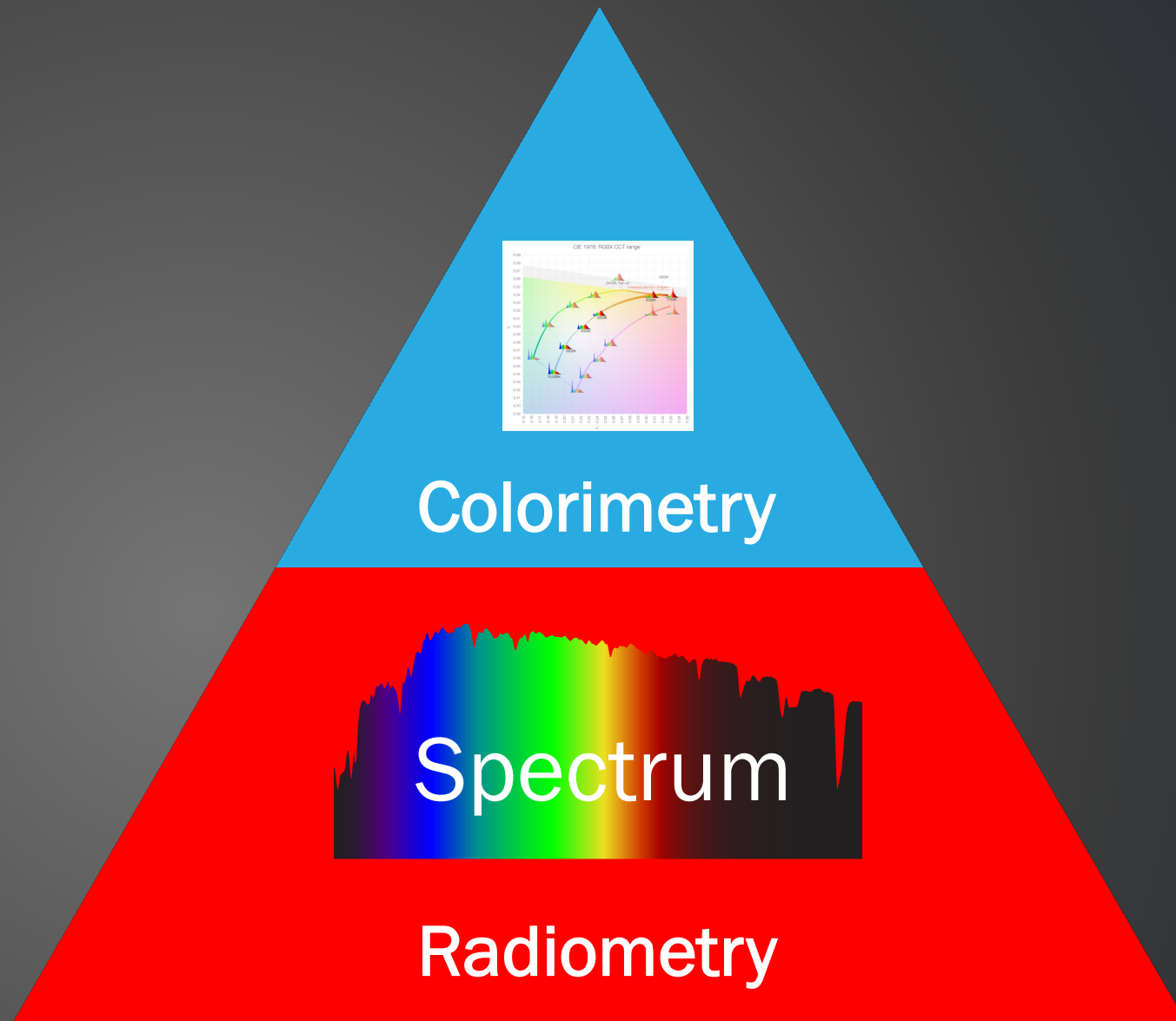
METERS AND METRICS

FOR CINEMATOGRAPHERS & LIGHTING TECHNICIANS

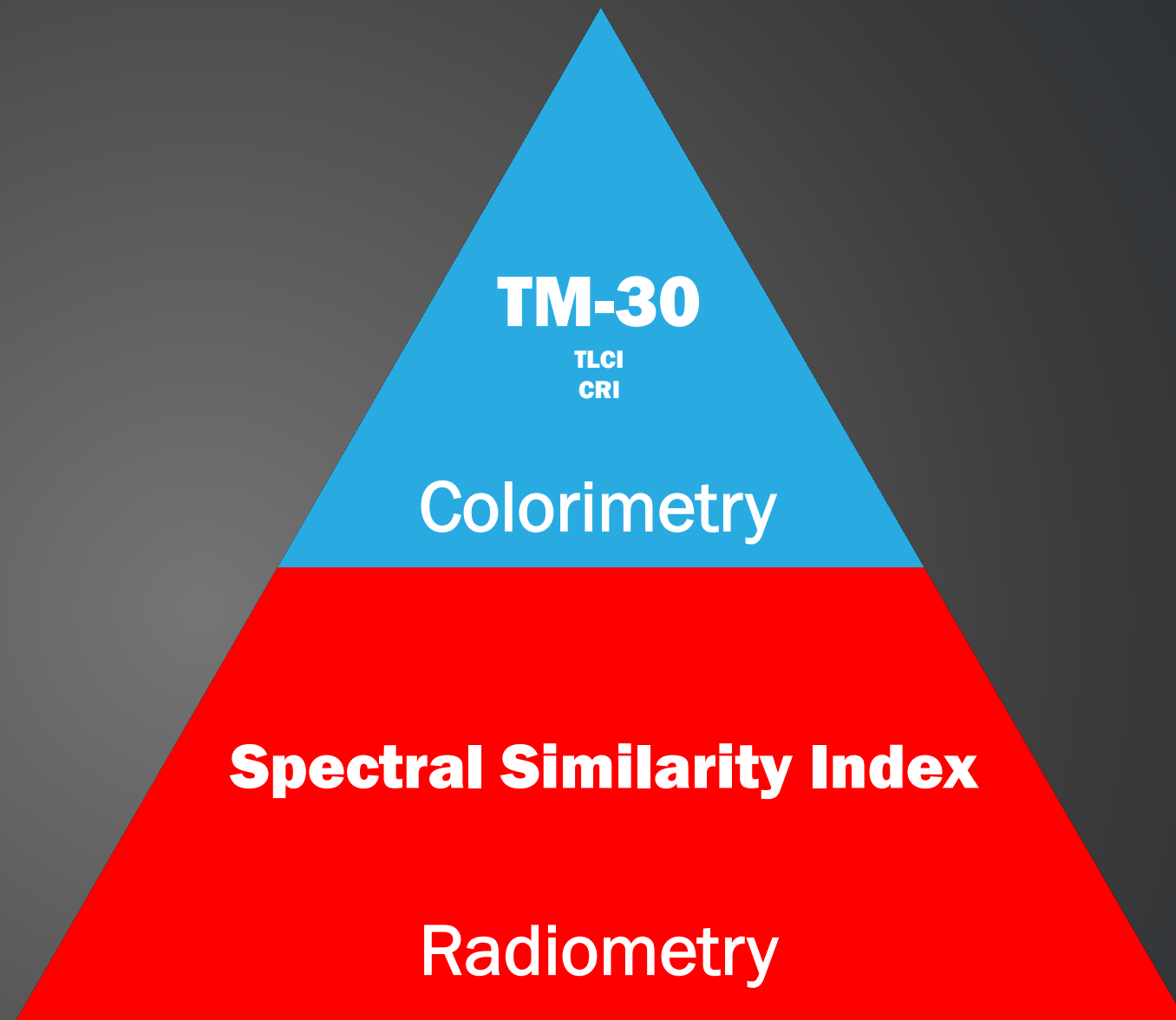


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LIGHTING COLOR QUALITY: A NEW 'MASLOW'S HIERARCHY OF NEEDS'



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Radiometric Quality

measures...

Light vs. Light

Spectrum Similarity Index (SSI)

Look at the two spectrum differences

Look at the score of their differences



Colorimetric Quality

measures...

Light→Object→Observer

TM-30

Look at the Hue Wheel for
general object hue/sat
color shift behavior

Rf score similar to CRI Ra

