THE CONCEPTS OF COLOR APPEARANCE AND PERCEPTION

BRIAN CHALMERS
COLOR PROGRAM MANAGER

BUILDING TRUST

TOPICS

- **The Concepts of Color Appearance and Perception**
  - Dimensions of Color
  - Color Theory
  - Color Observation
- **Understanding Pigments**
  - Color Durability
  - Weathering Impacts
- **Sika Coatings Tint Bases**
  - Function and purpose
- **National Color Lab**
  - Submitting samples




APPEARANCE IS MORE THAN COLOR

COLOR APPEARANCE

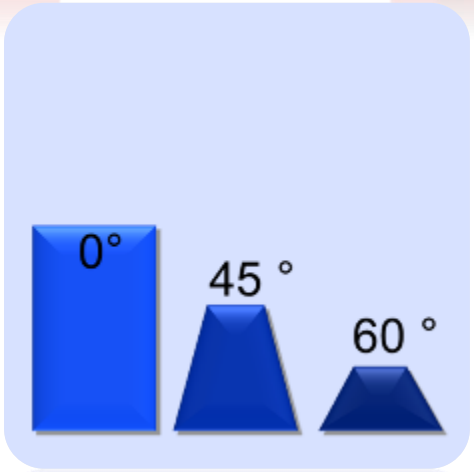
Texture

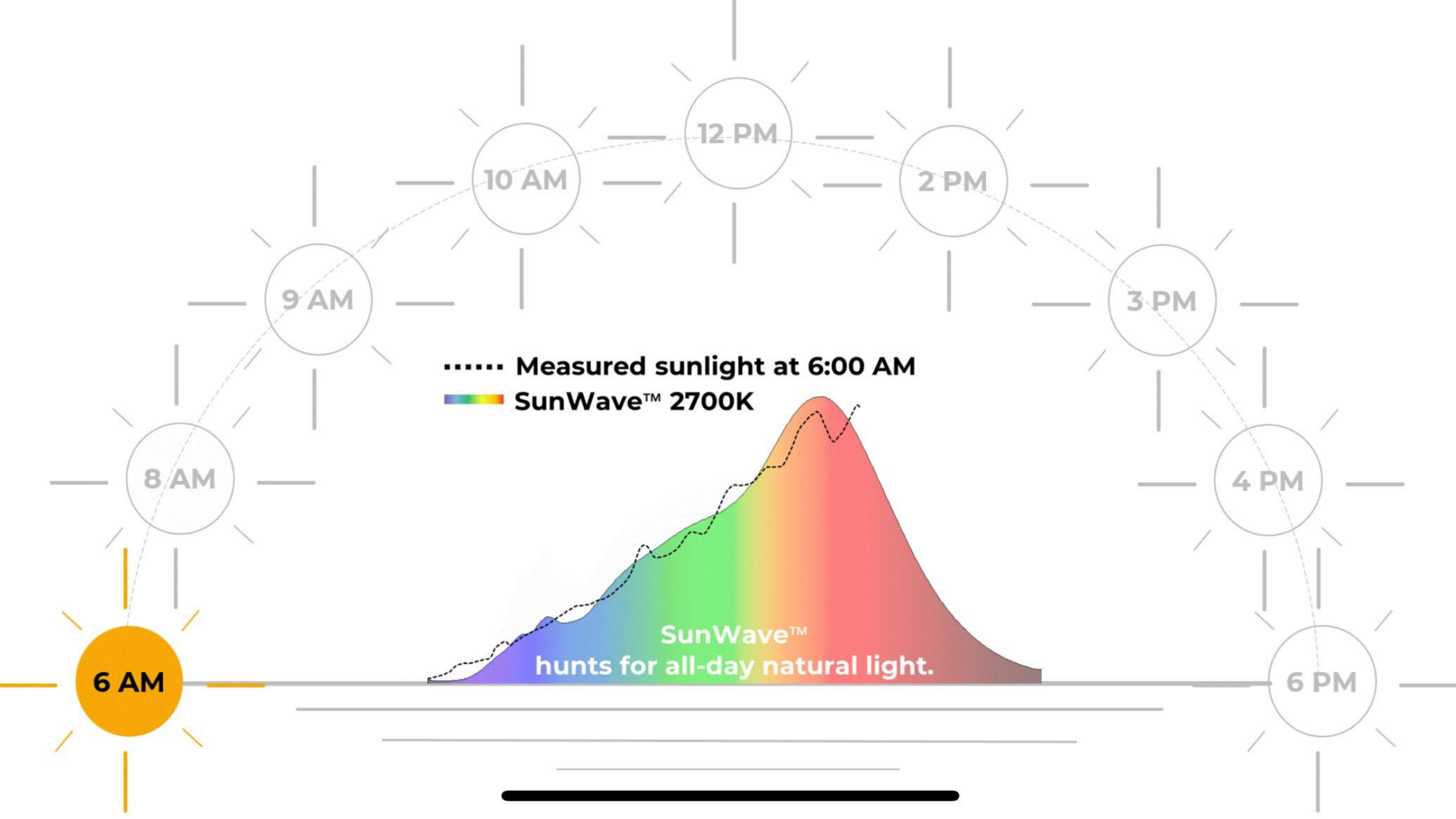
Gloss

Opacity (Hiding)

Haze

Reflex (Flop)

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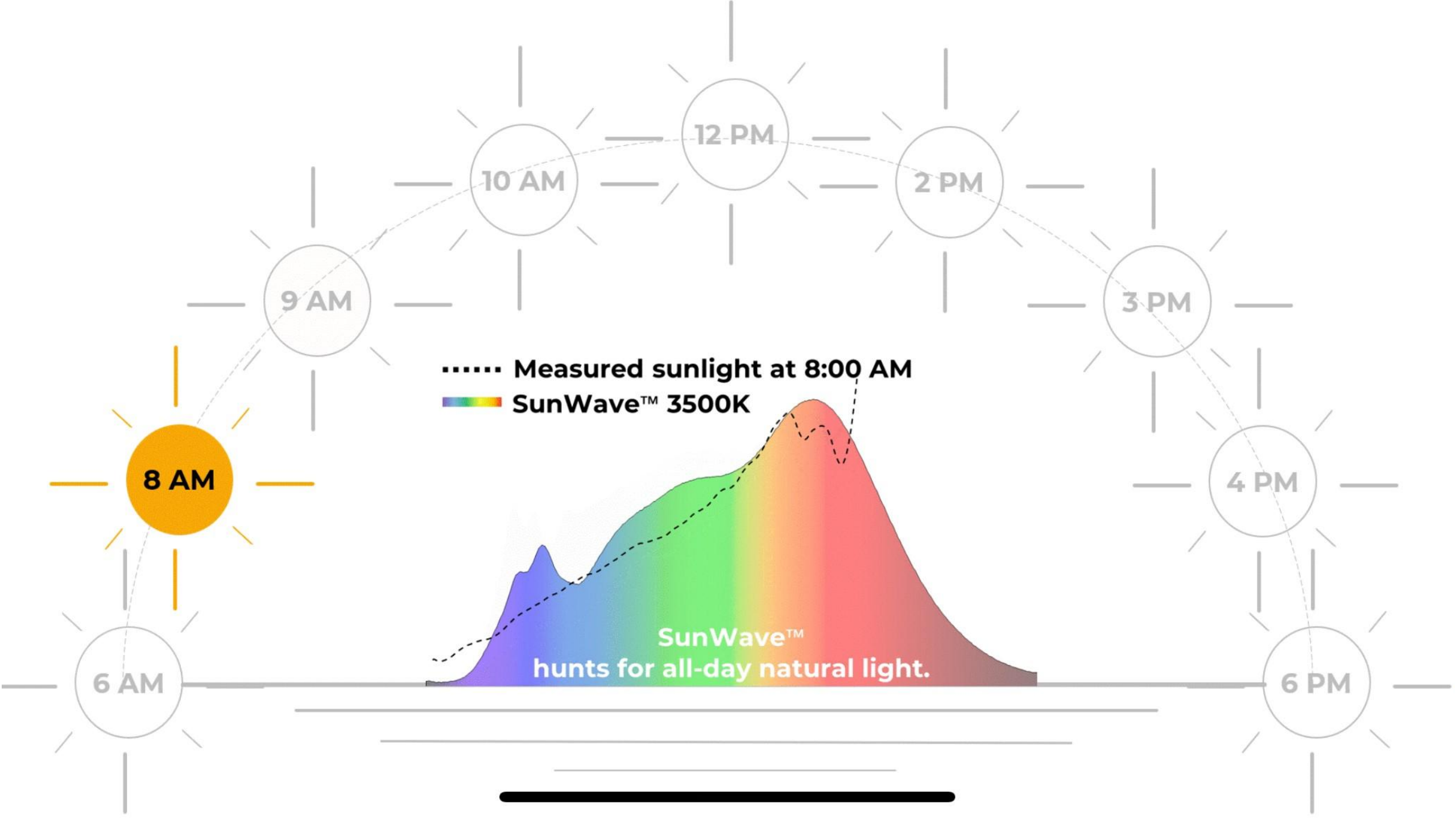
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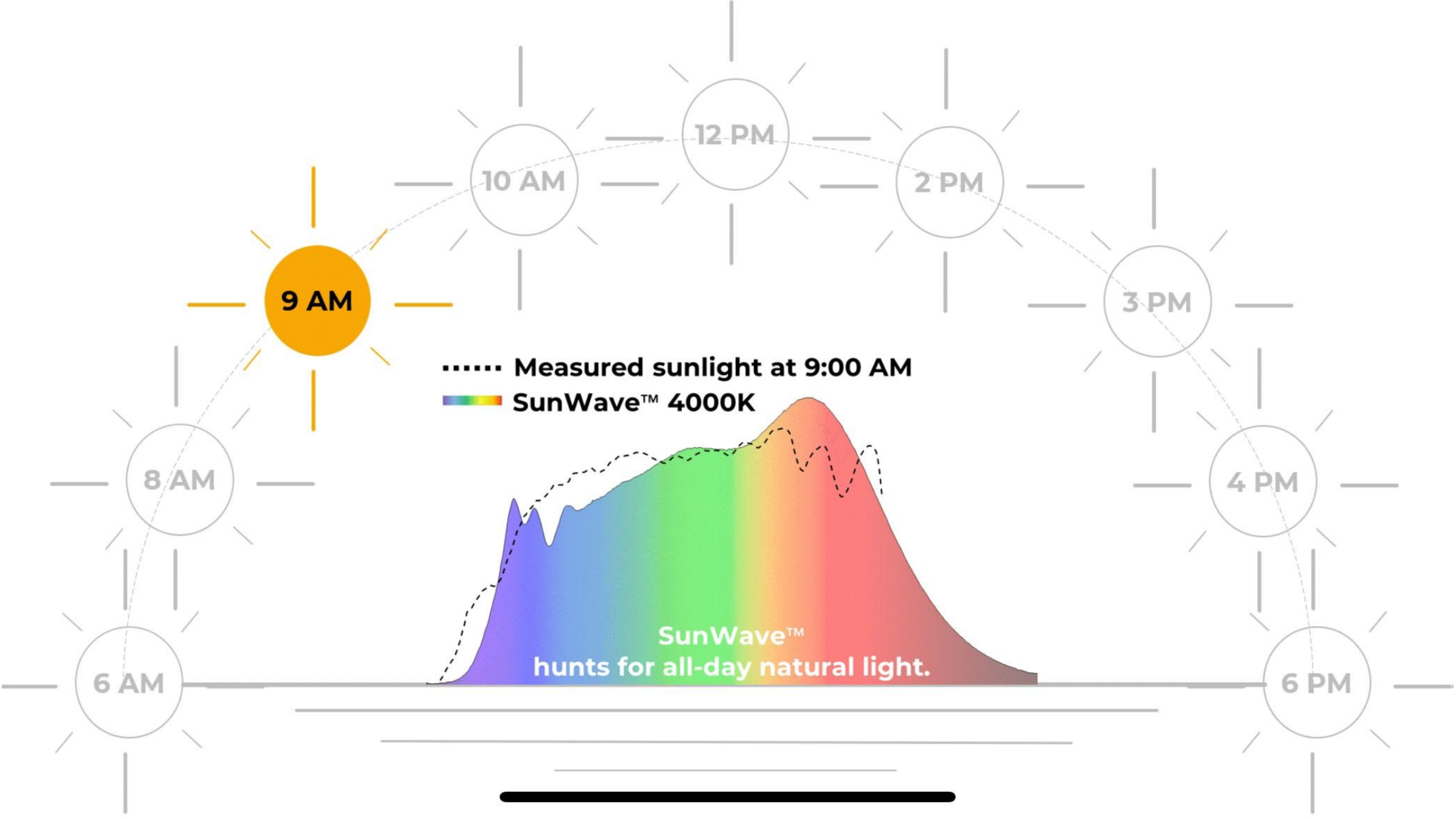
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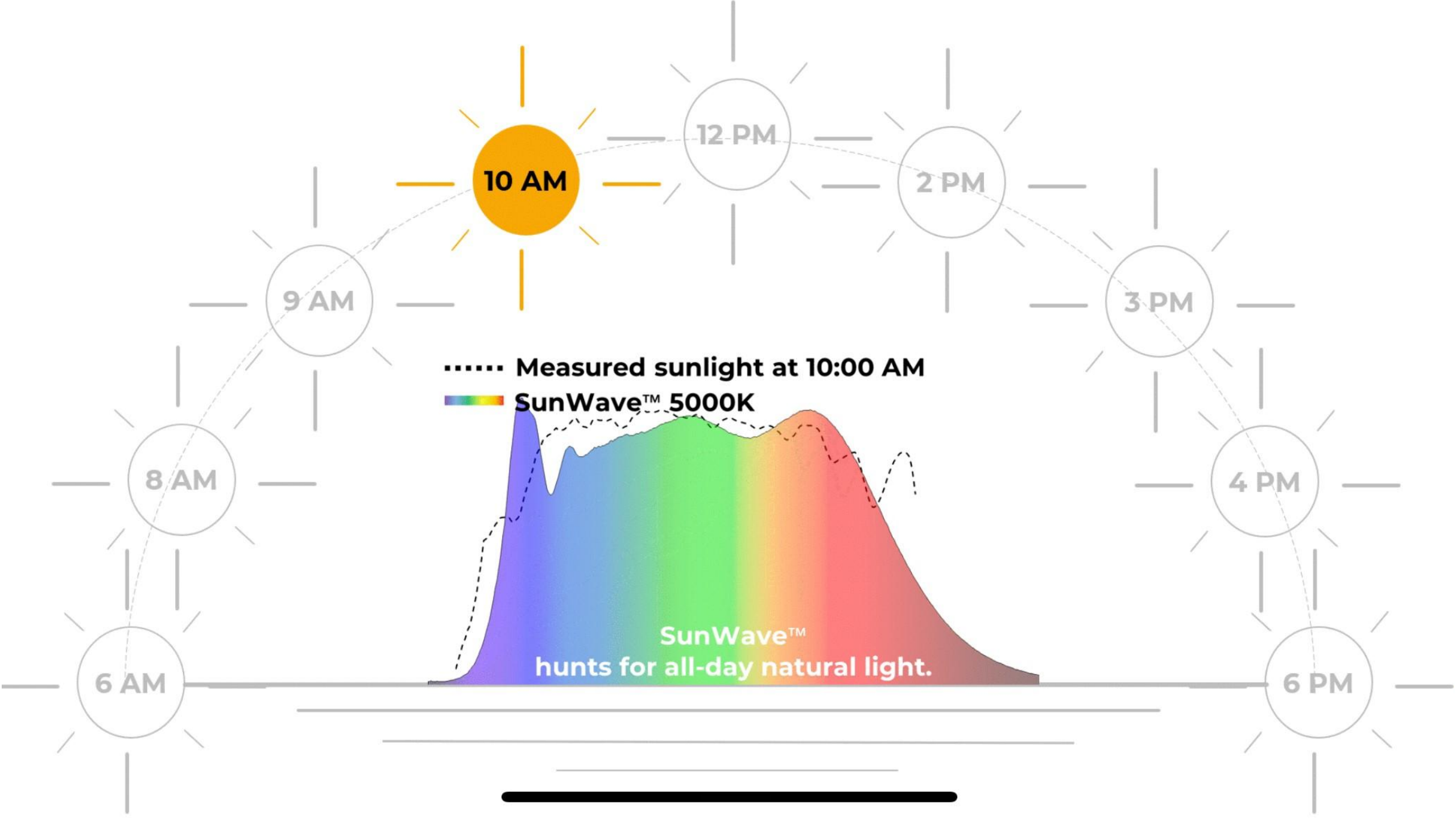
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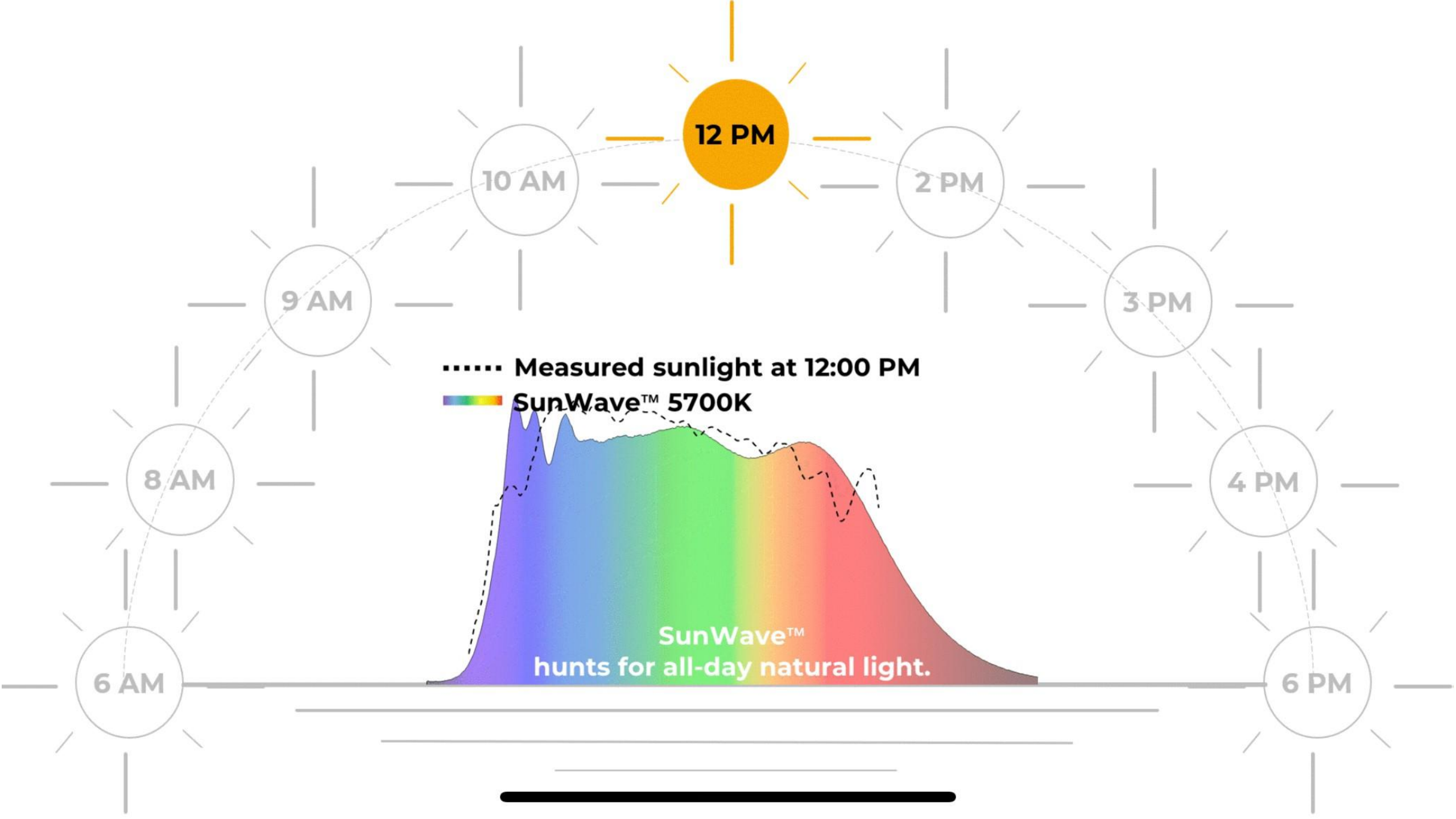
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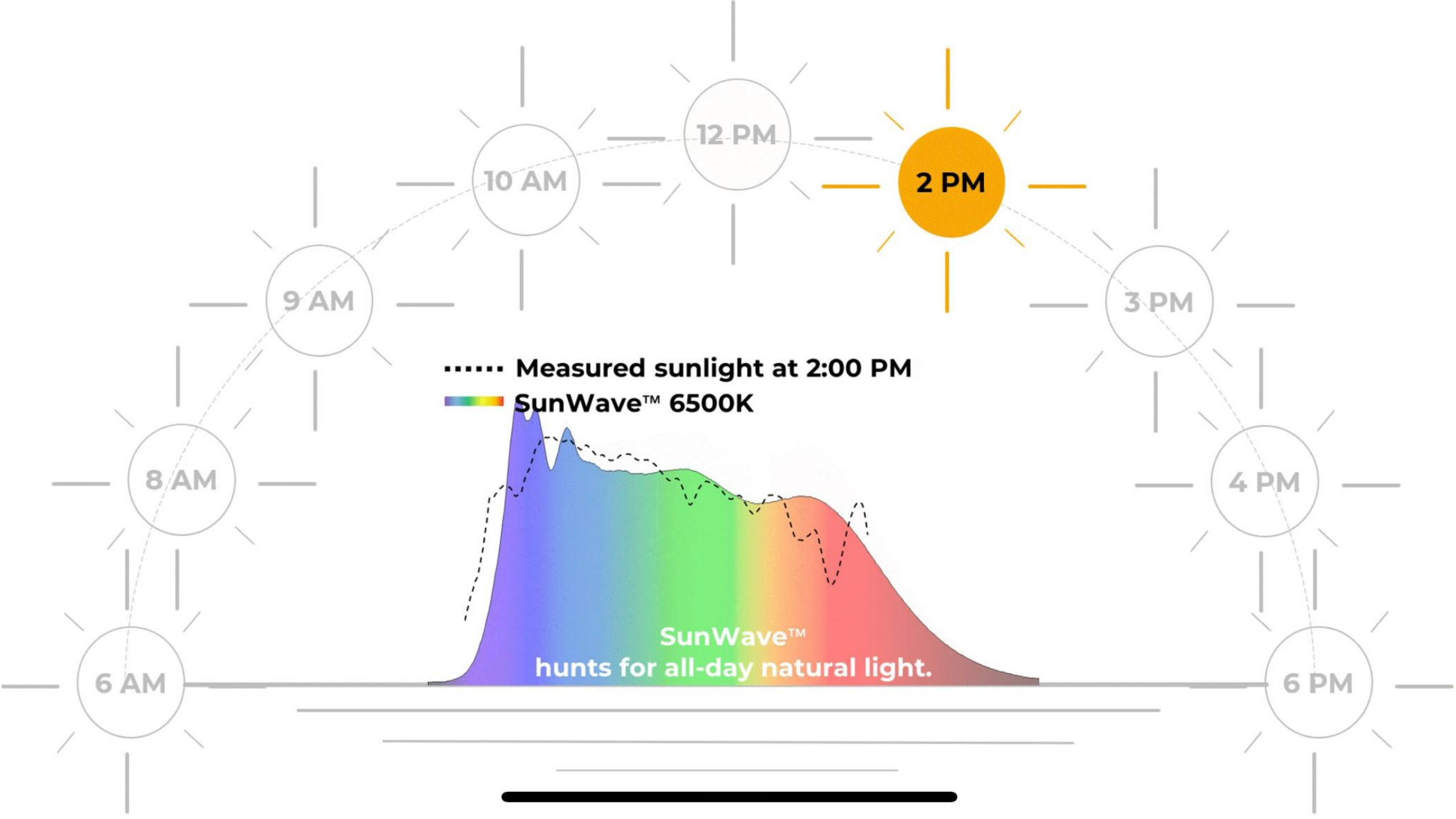
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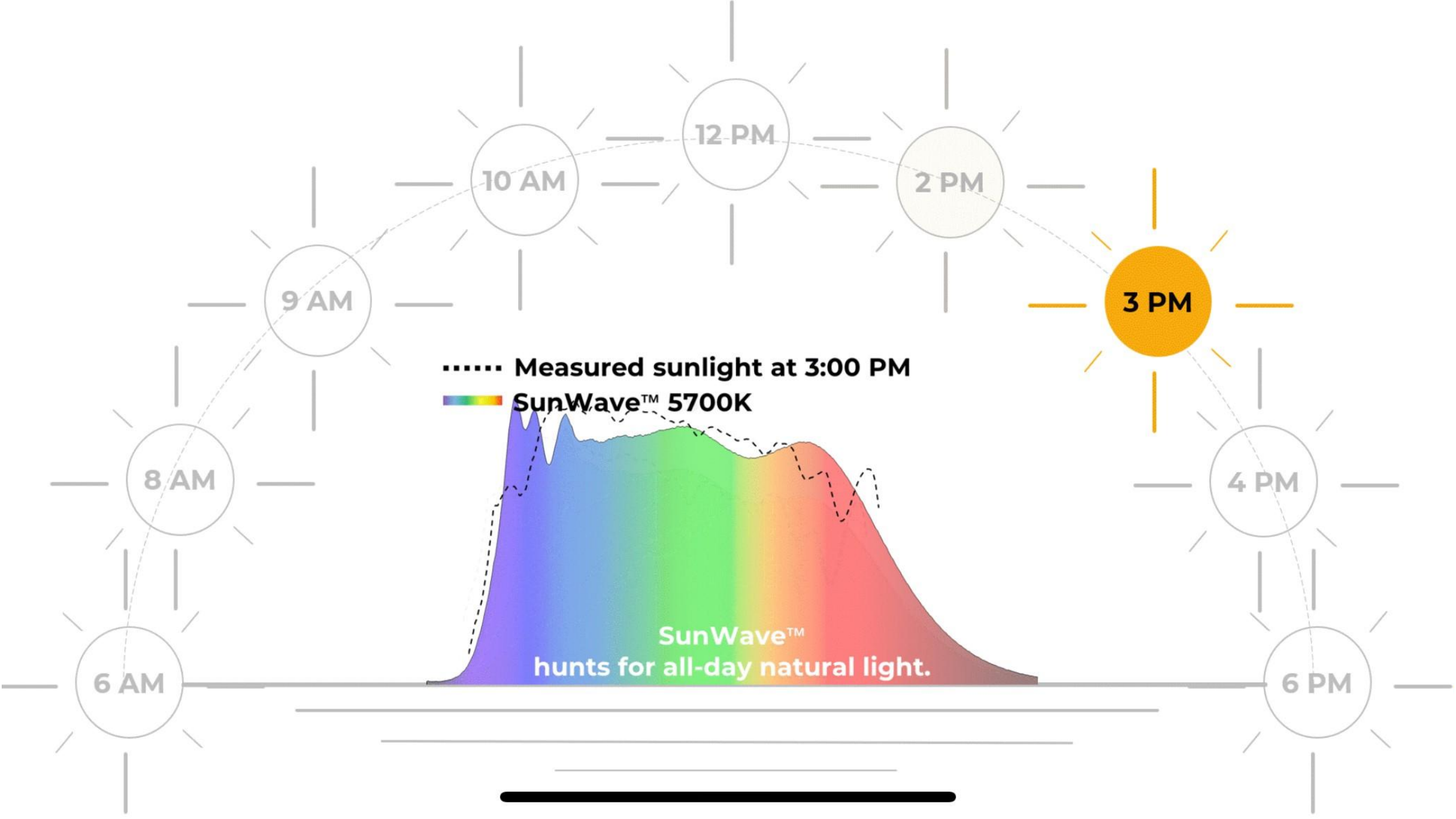
hunts for all-day natural light.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Measured sunlight at 3:00 PM
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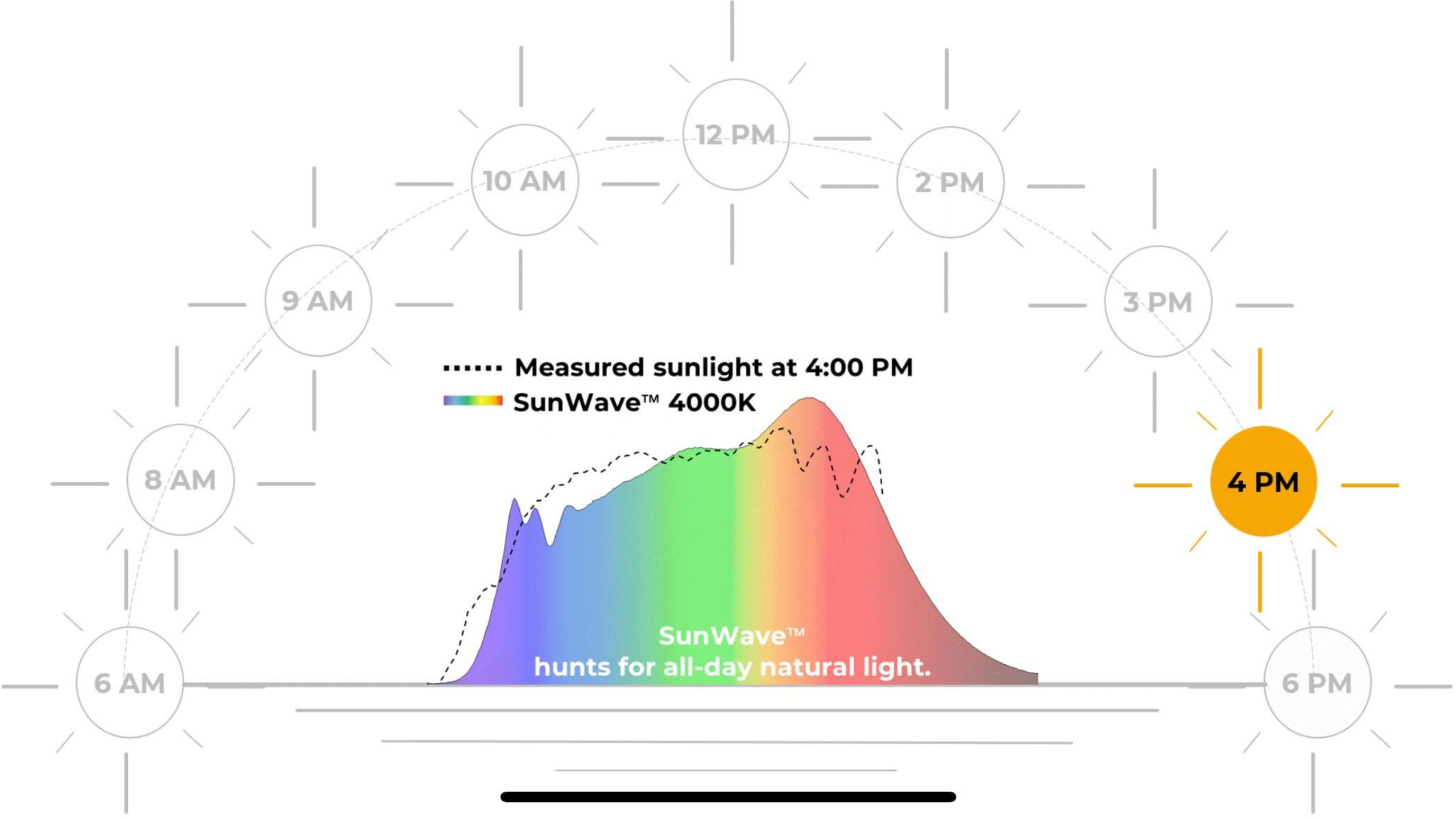
hunts for all-day natural light.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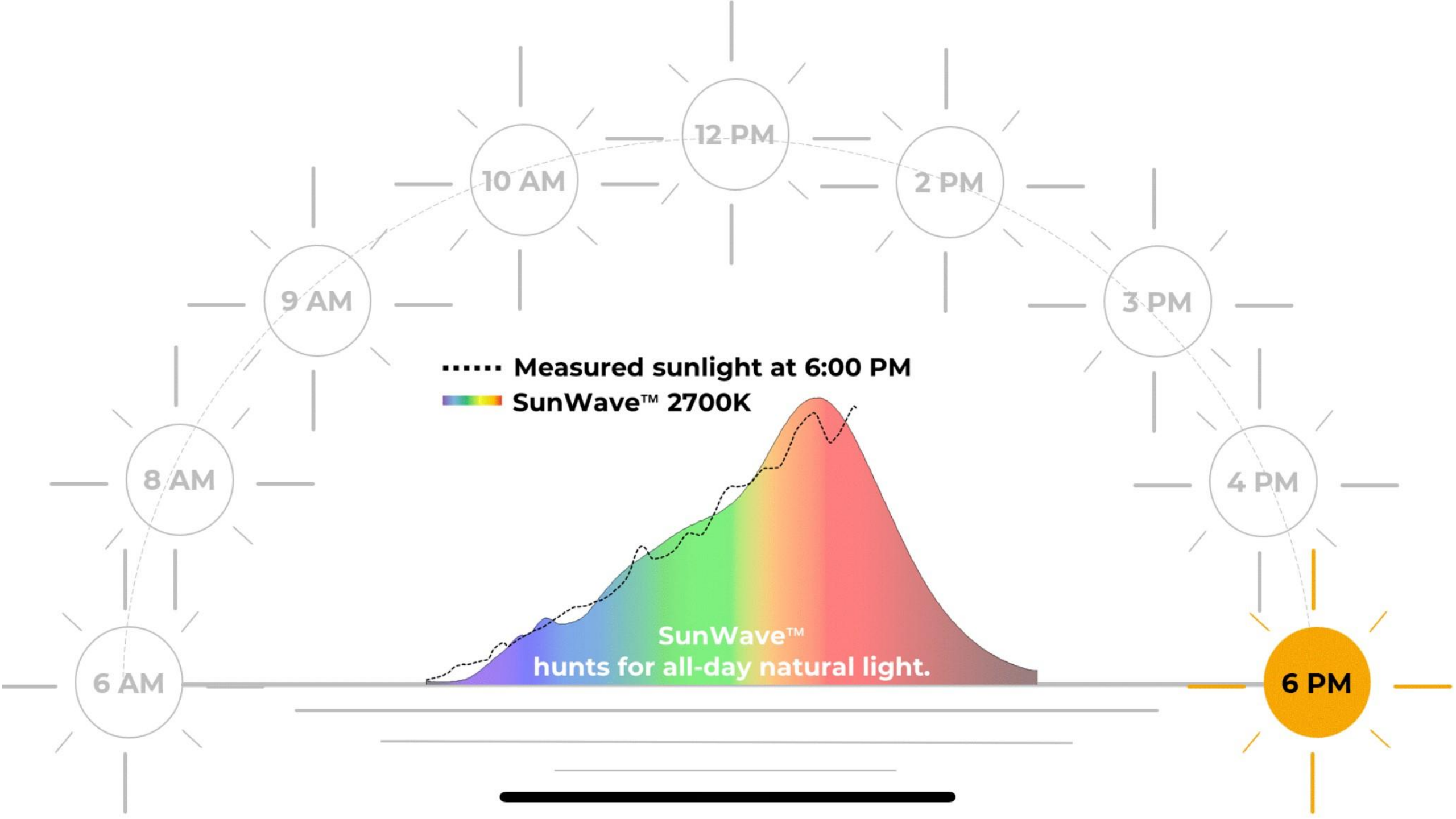
hunts for all-day natural light.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Measured sunlight at 6:00 PM
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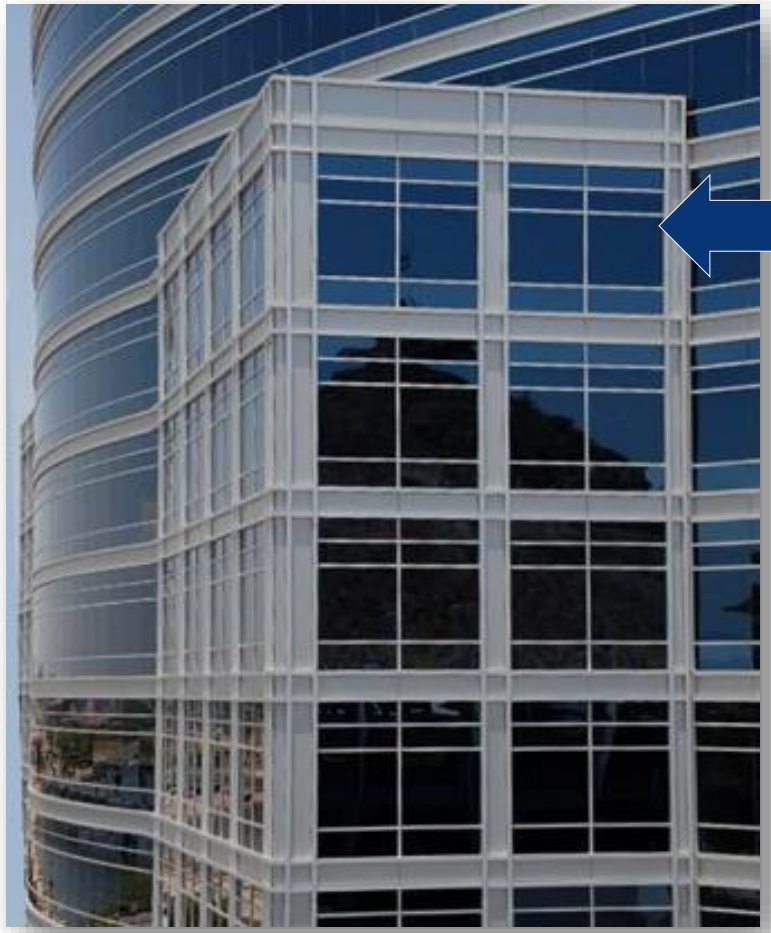
COLOR IS AFFECTED BY LIGHT

- **The same building appears to be a different color depending on the time of day.**

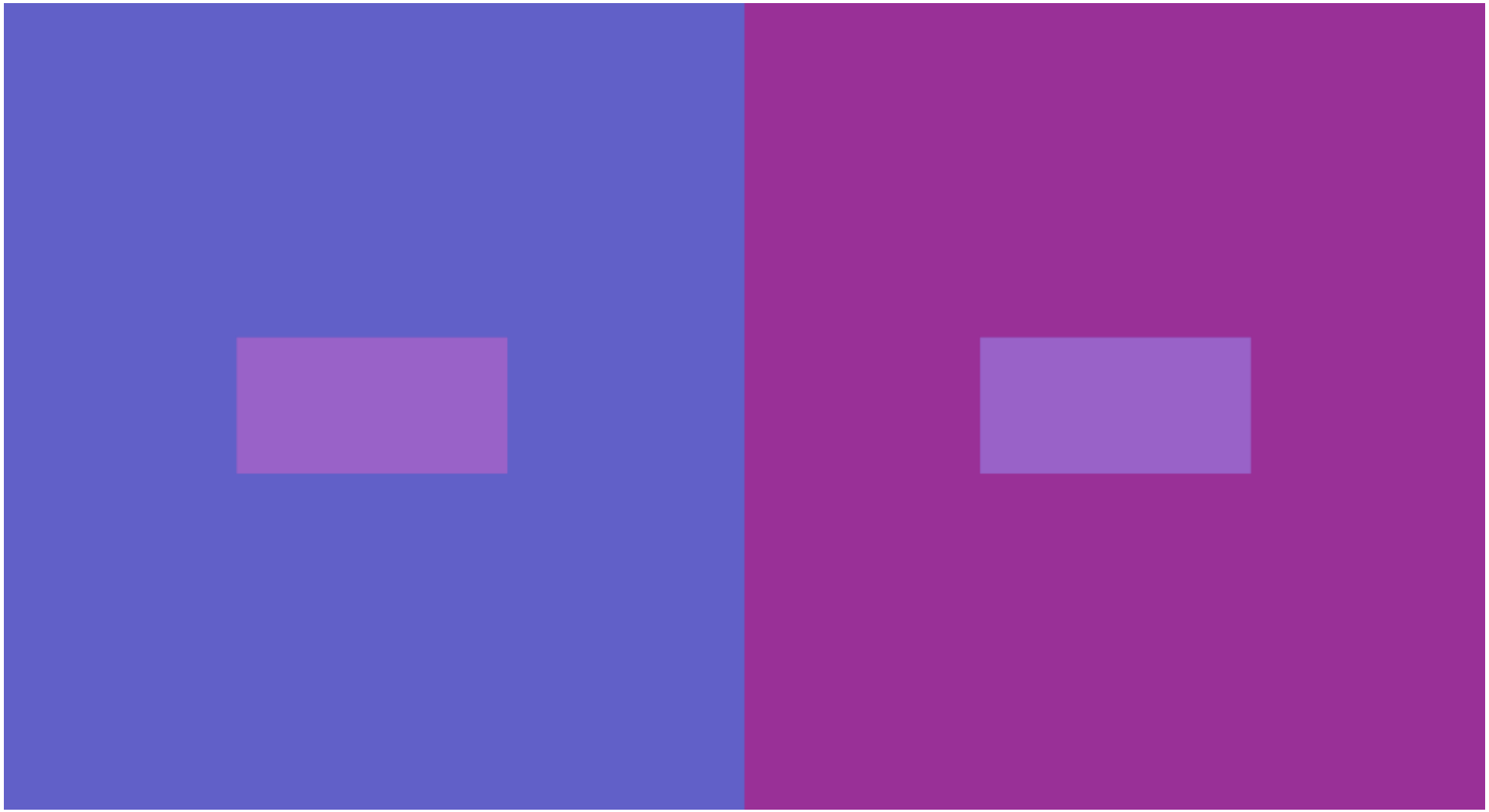


COLOR PERCEPTION

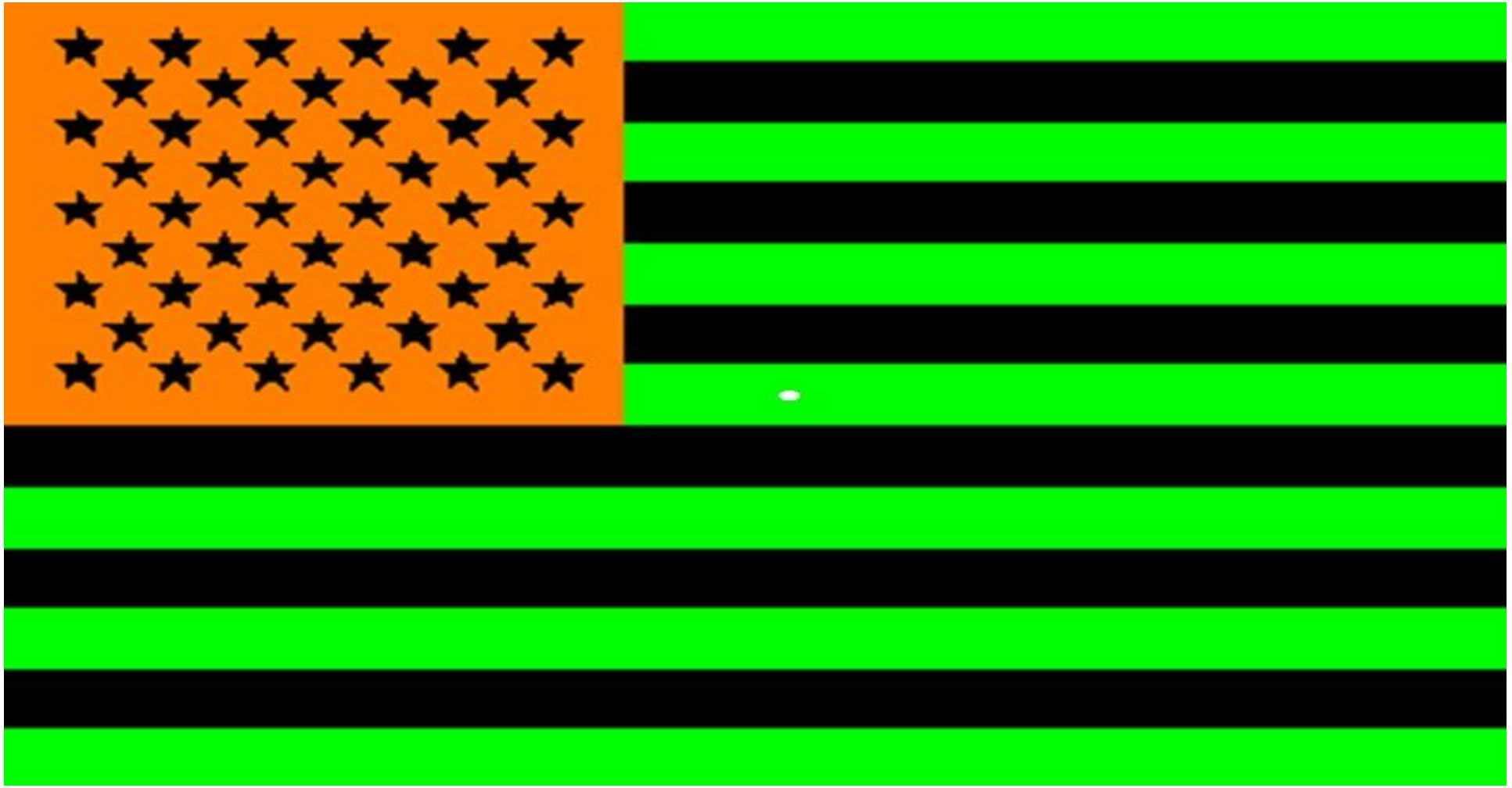
- **Our perception of color is affected by:**
  - Surrounding Colors
  - What we have seen before
  - Food, Alcohol, Caffeine & Medication
  - Our Age

BUILDING TRUST

COLOR PERCEPTION

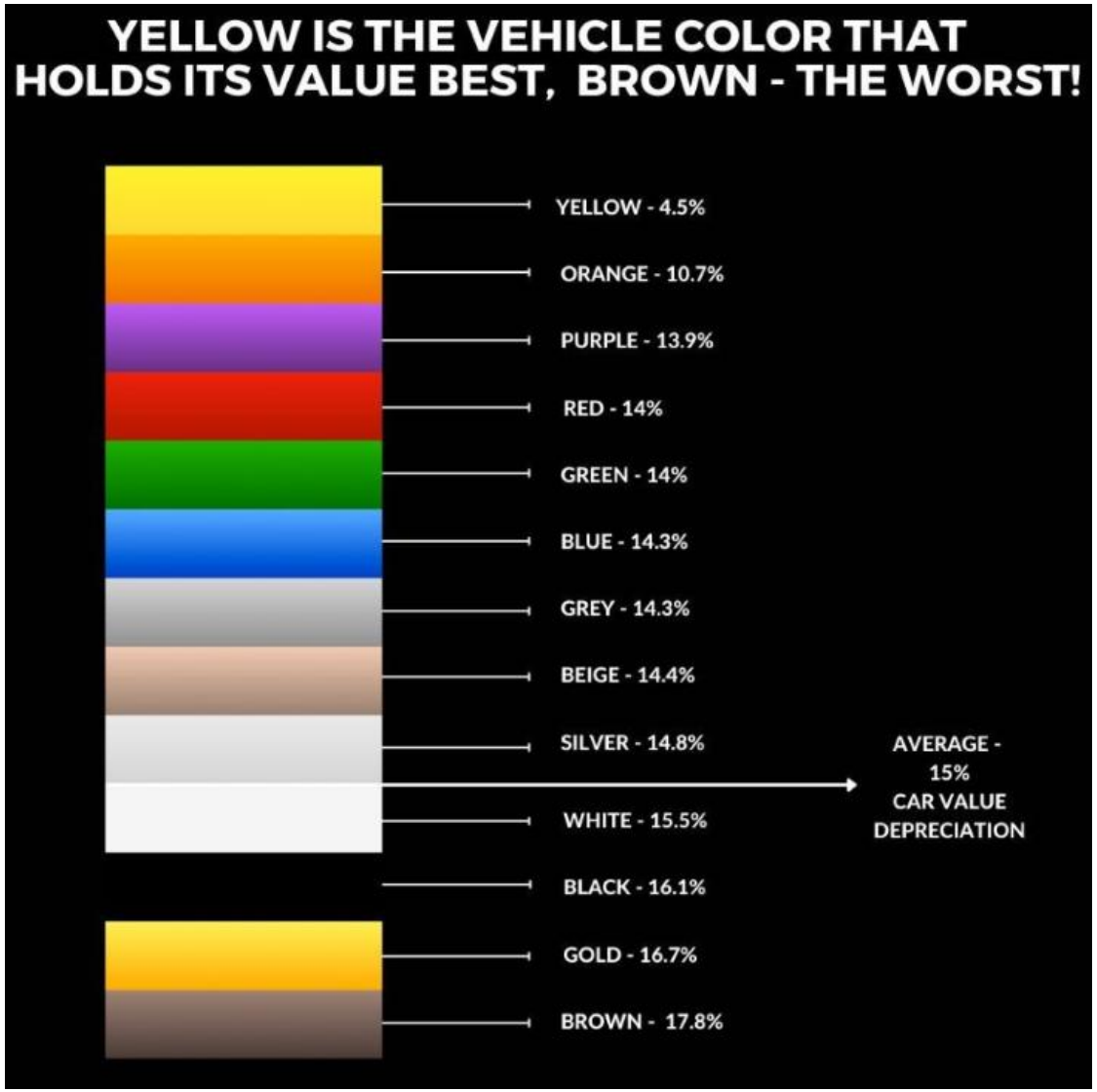


COLOR PERCEPTION



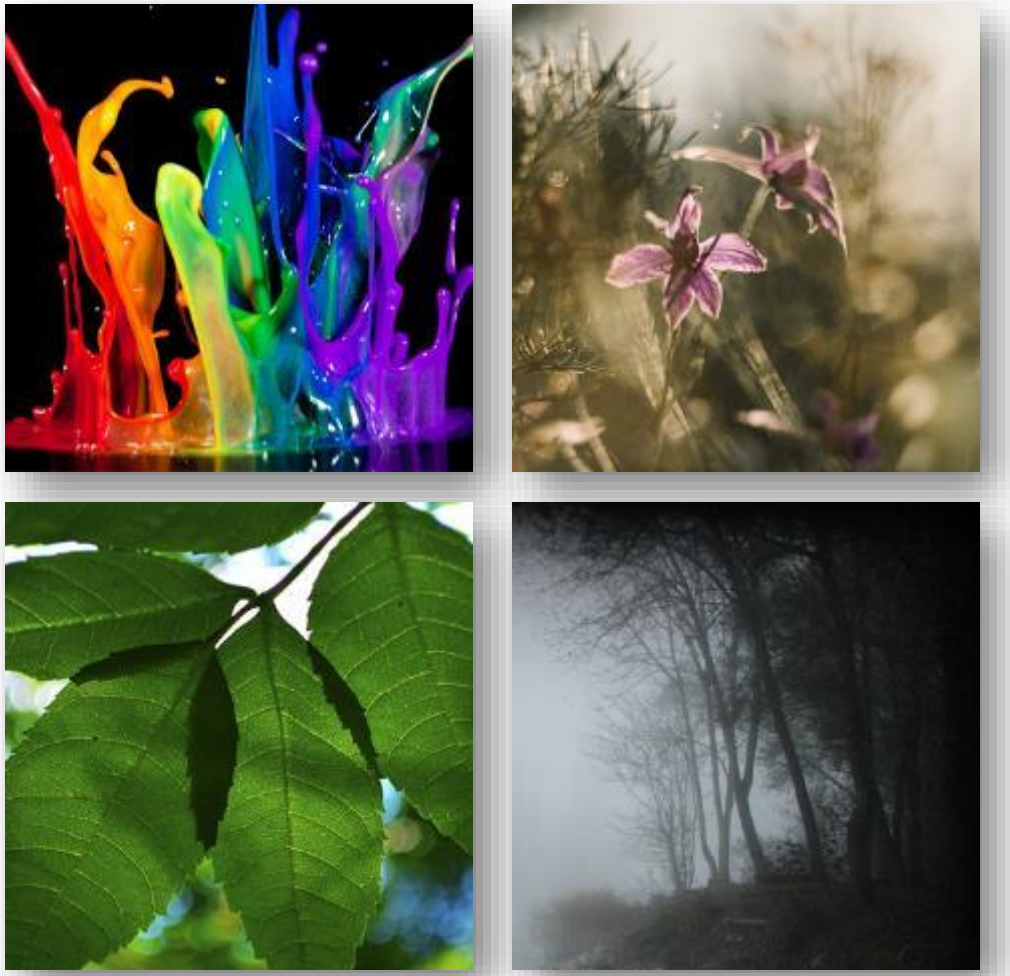
COLOR PERCEPTION

THE VALUE OF COLOR



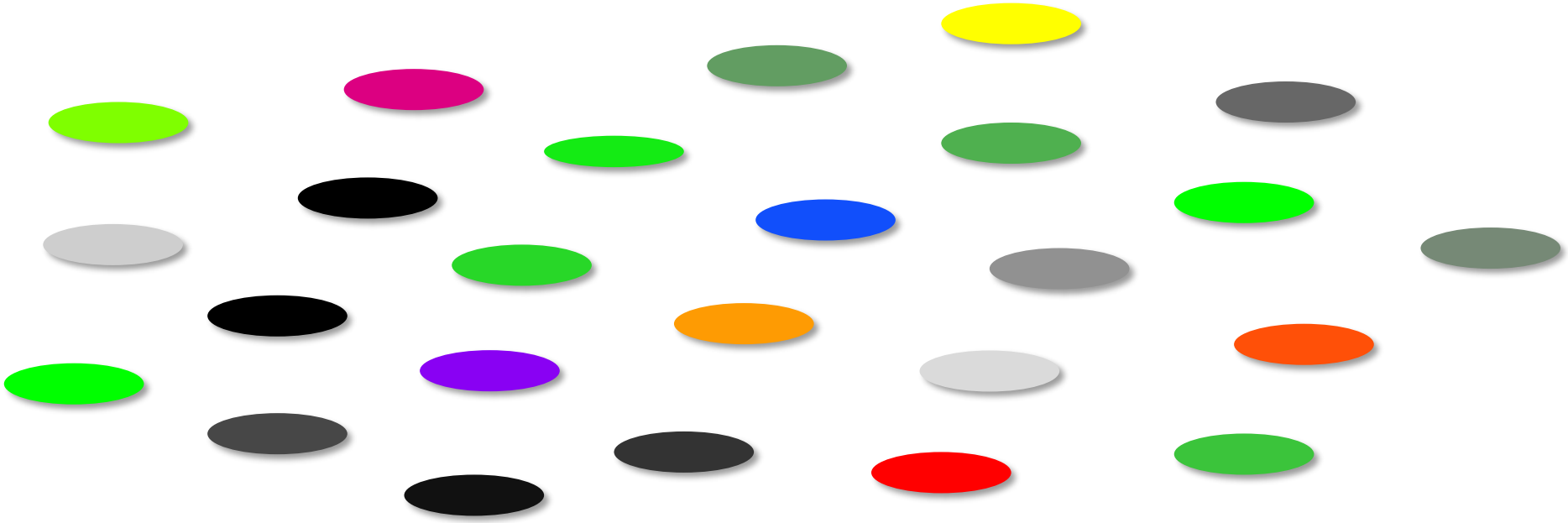
COLOR CONCEPTS & FUNDAMENTALS

- **A “natural” color language**
  - Think about the kinds of words you use to describe colors and color differences.
  - Do you use a system?
  - The next exercise communicates an innate system of how to categorize color.



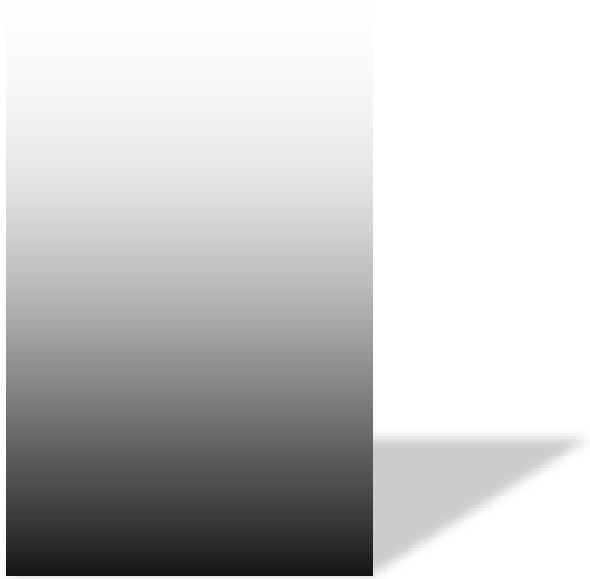
A “NATURAL” COLOR LANGUAGE

- **Imagine placing these colored chips in “order”**

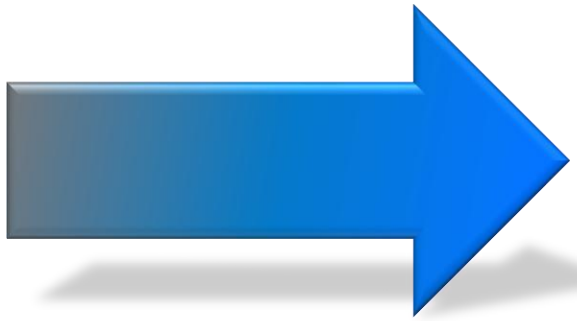


THREE DIMENSIONS OF COLOR

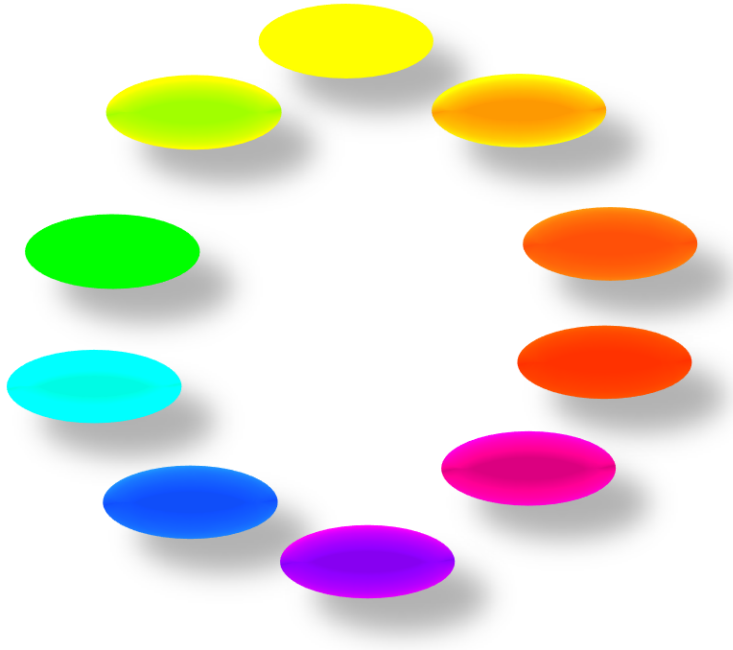
LIGHTNESS



CHROMA



HUE



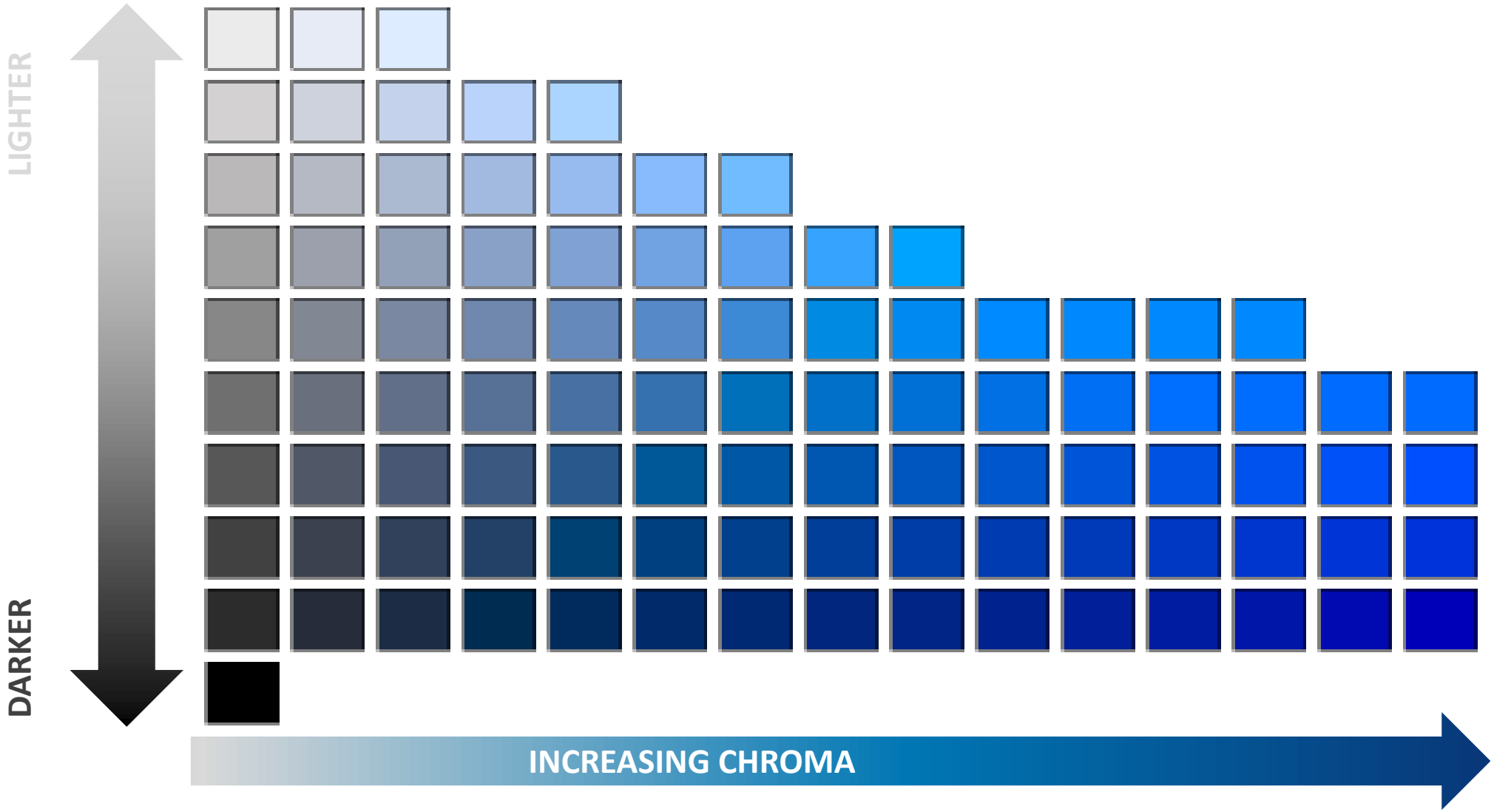
LIGHTNESS-DARKNESS

Lighter

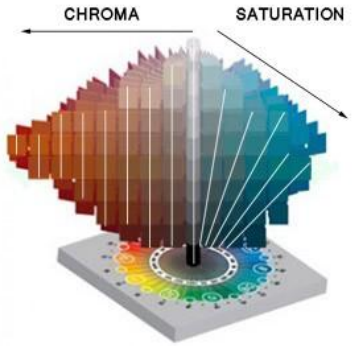
The lightness/darkness comparison vs. targeted color sample becomes a visual determination when evaluating colors.

Darker

CHROMA OR PURITY OF COLOR

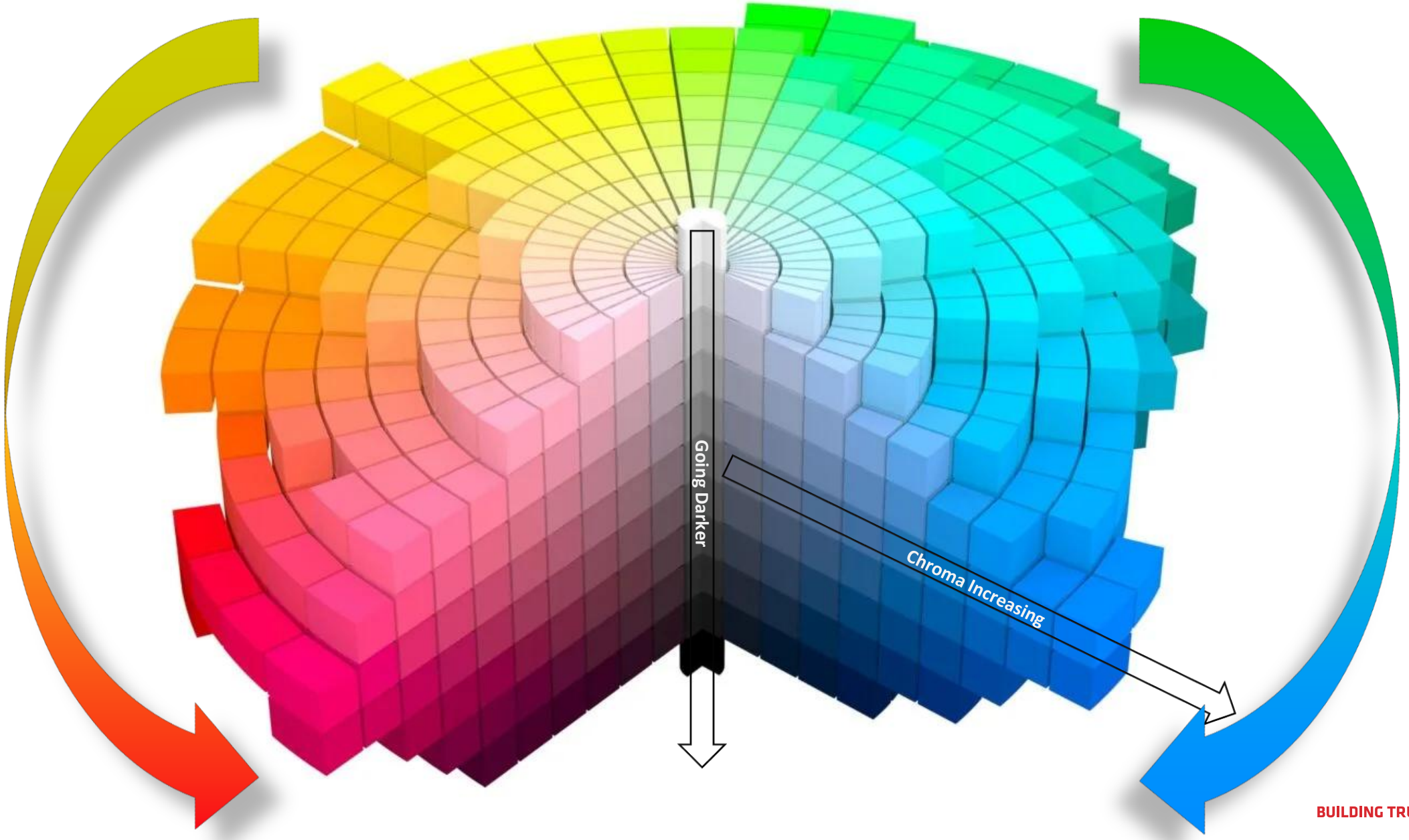


CHROMA OR PURITY OF COLOR



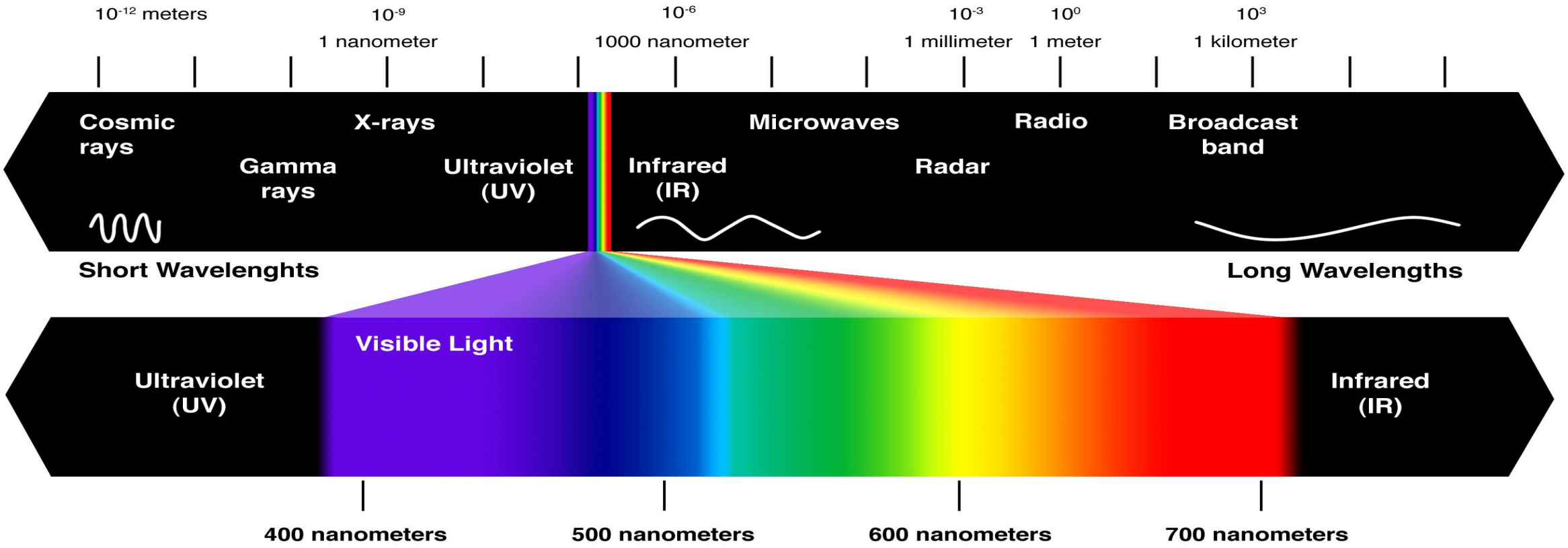
- **Chroma describers**
  - Saturated, Dull, Intense, Colorful, Greyish, Pale, Pastel, Vivid

HUE OR SPECTRUM OF COLOR

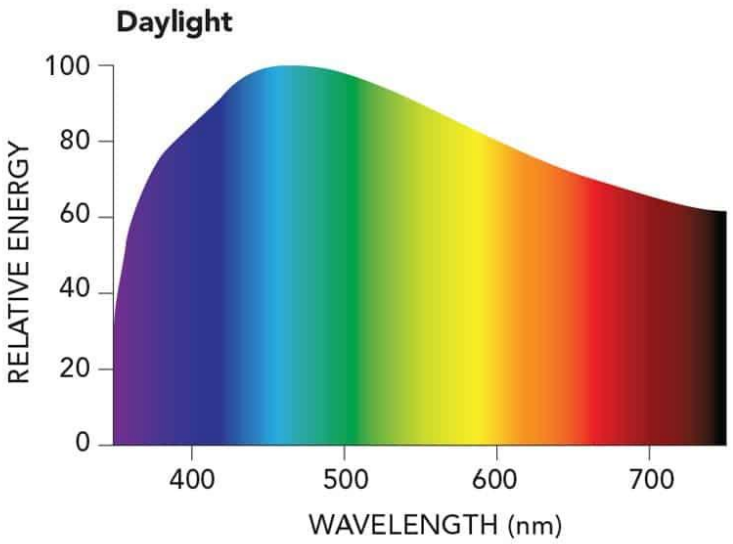


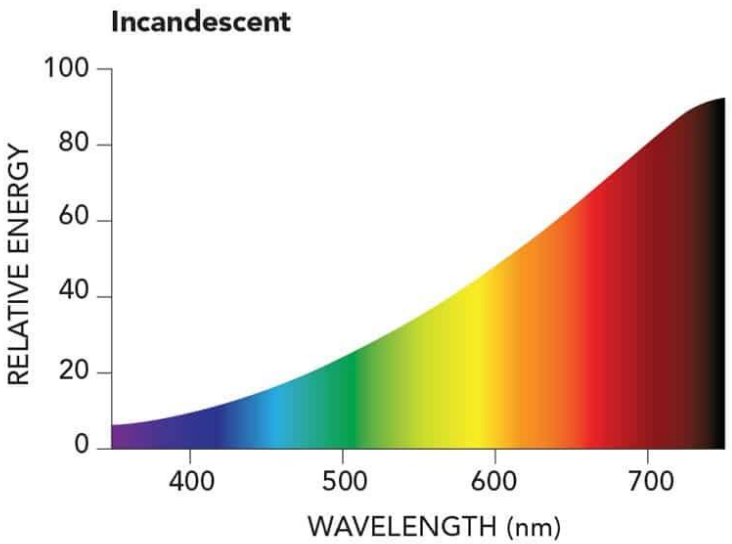
COLOR THEORY – LIGHT IS ENERGY

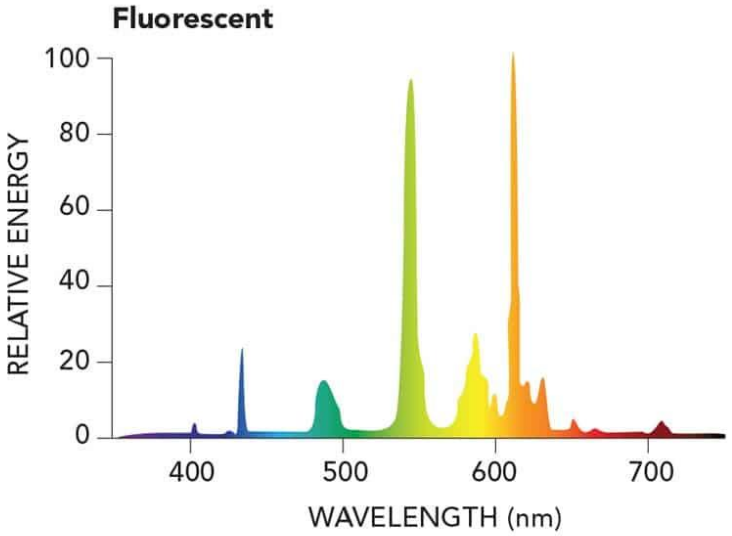
- Our eyes can detect only a small portion of the Electromagnetic spectrum
- Wavelengths of visible light are measured in billionths of meters or nanometers

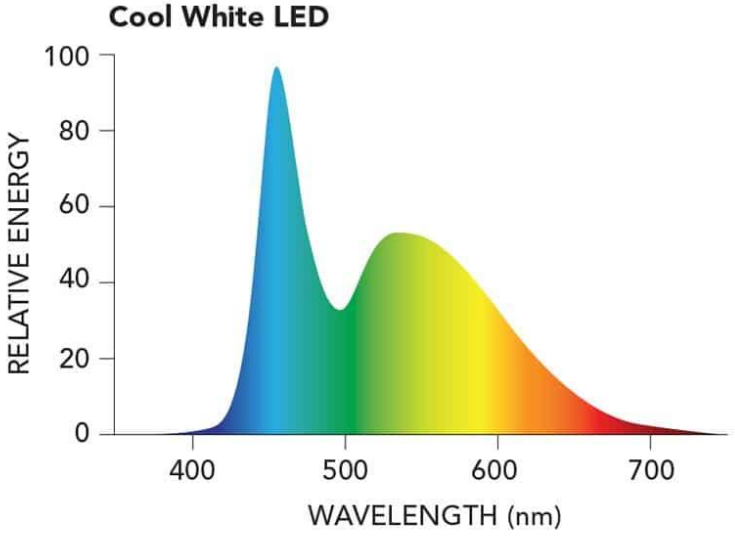


LIGHT SOURCE



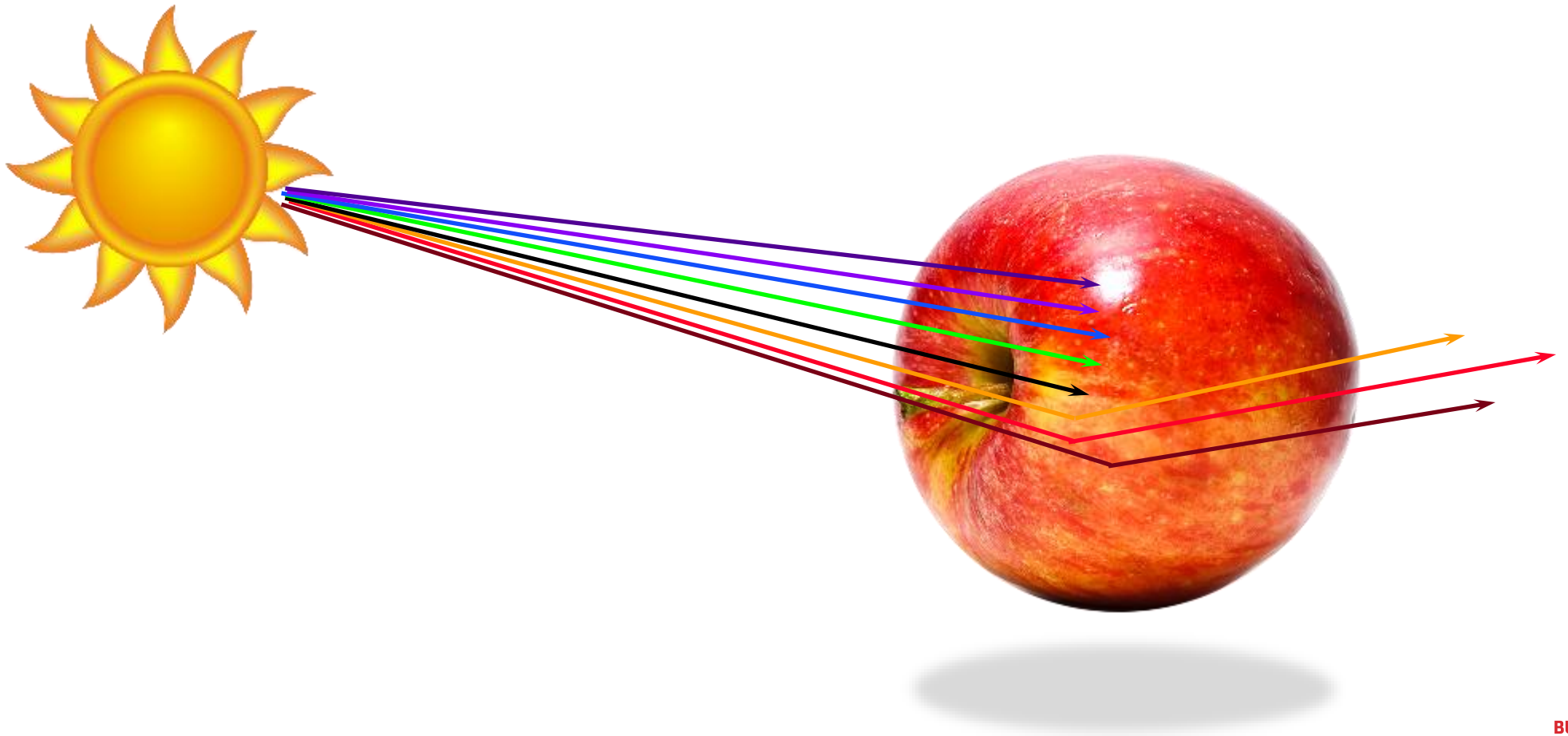






LIGHT REFLECTANCE

- **Light / Object Interaction**
  - This apple absorbs violet and green light while reflecting orange and red light

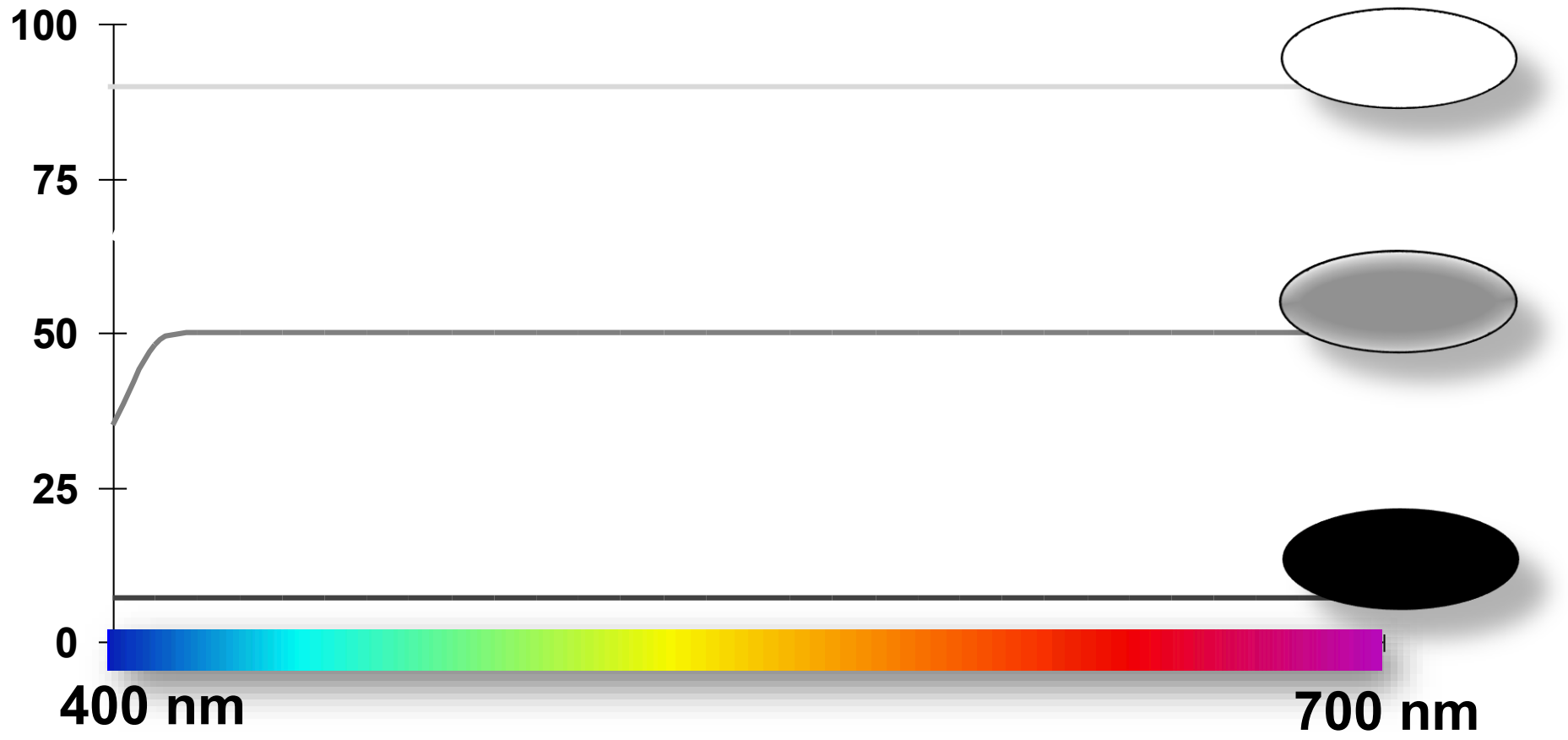


LIGHT REFLECTANCE

- **This spectral graph shows how much light is reflected at each wavelength.**

WHITE, GRAY AND BLACK REFLECTANCE

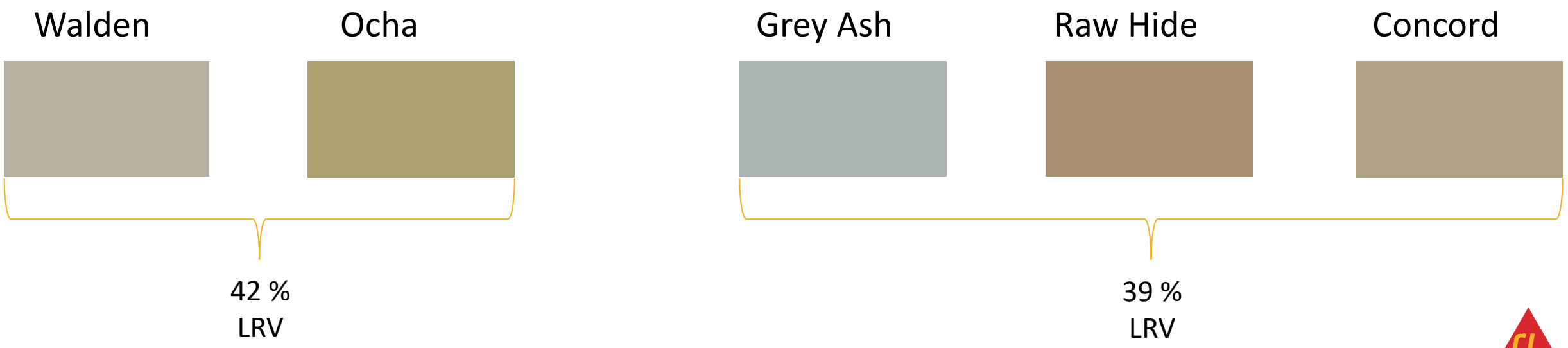
- **Three Spectral Curves**



LRV – LIGHT REFLECTANCE VALUE

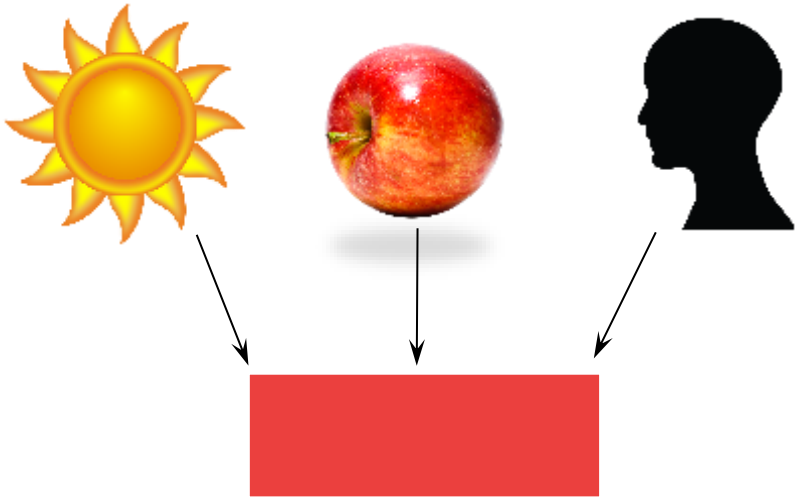
- LRV - Light reflectance value (LRV) quantifies the amount of natural or artificial light reflected from a colored surface.

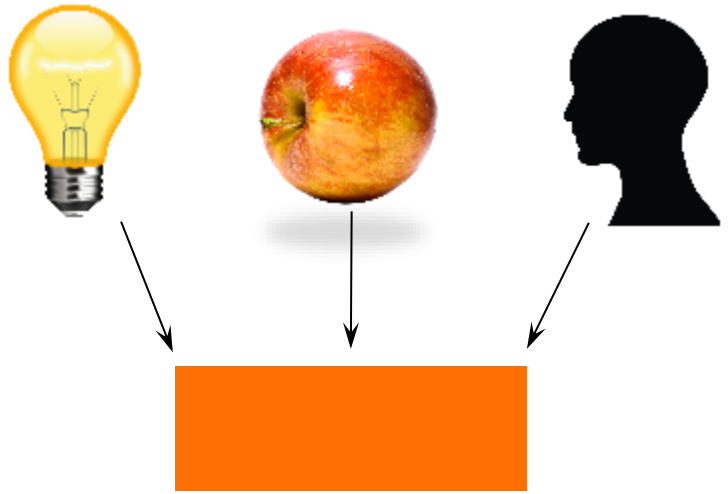
- Value 0 absorbs light completely
- Value 100 reflects light completely
- Different colors can have identical LRVs



OBSERVING COLOR

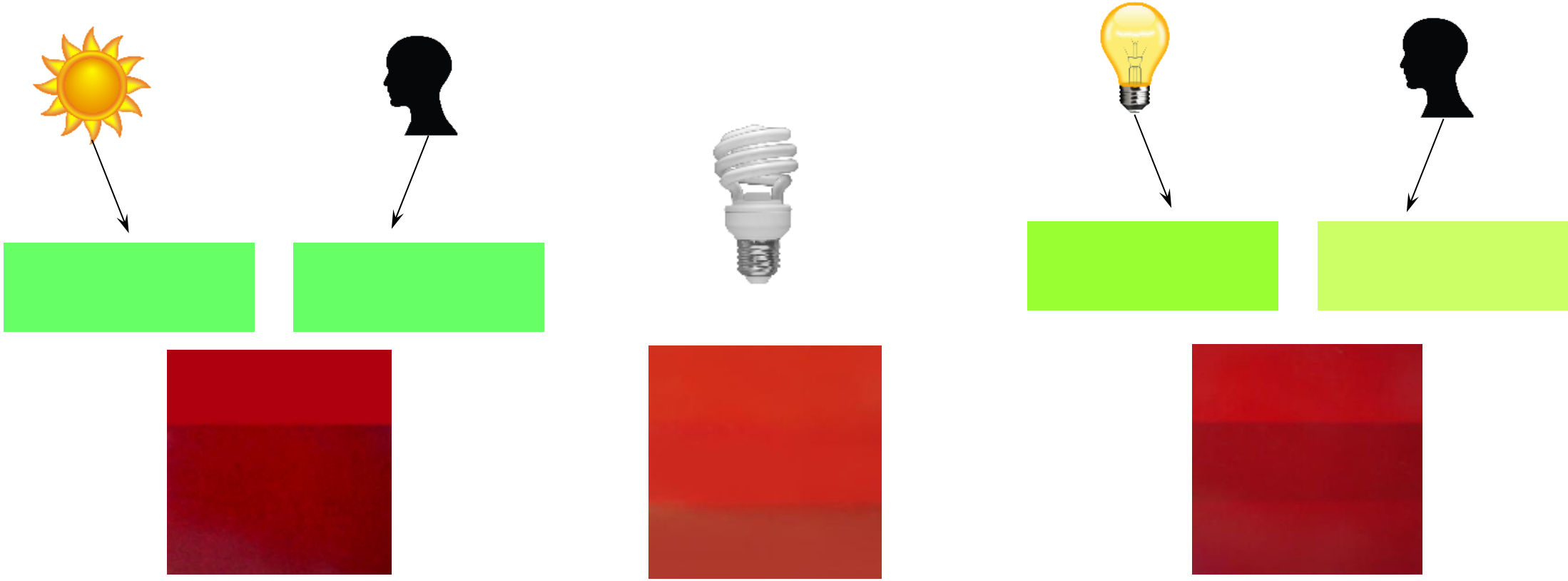
- **Flare**
  - An object's tendency to look one color under a given light source…and a different color under another…





OBSERVING COLOR

- **Metamerism**
  - When two objects match under one lighting condition…
    And mismatch under another….



UNDERSTANDING PIGMENTS / COLORANTS

- **Color Durability**
- **Pigments**
  - Inorganic vs. Organic
  - Stability
- **Weathering**
  - **Ivy Green** color combination analysis

WATERBORNE ARCHITECTURAL COLORANTS

Inorganic Colorants

Derived from naturally occurring minerals. Among the earliest materials used as pigments.

Organic Colorants

Synthetically produced. Industry emerged towards the end of the 19th century.

WATERBORNE ARCHITECTURAL COLORANTS

Tint System comprised of 12 Colorants

- **Inorganic Pigments**
  - C - Yellow Oxide
  - F - Red Oxide
  - I - Brown Oxide
  - KX - Titanium Dioxide
  - L - Raw Umber

- **Organic Pigments**
  - AXX - Organic Yellow
  - B - Lamp Black *
  - D - Phthalo Green
  - E - Phthalo Blue
  - R - Organic Red
  - T - Medium Yellow
  - V - Magenta

*** Lamp Black behaves as an inorganic pigment**

WATERBORNE ARCHITECTURAL COLORANTS

- **Excellent** (Stable)
  - B - Lamp Black *
  - C - Yellow Oxide
  - F - Red Oxide
  - I - Brown Oxide
  - KX - Titanium Dioxide
  - L - Raw Umber
- **Good** (Semi-stable)
  - D - Phthalo Green
  - E - Phthalo Blue
  - V - Magenta
- **Poor**(Less Stable)
  - AXX - Organic Yellow
  - R - Organic Red
  - T - Medium Yellow

*** Lamp Black behaves as an inorganic pigment**

INORGANIC COLORANTS

- **Best Performing Colorants**

  - **Benefits**
    - Low to Moderate Cost
    - Very Good Light Fastness
    - Good Heat Stability
    - High Opacity / Hiding
    - Manufactured from the purest forms of pigments

  - **Drawbacks**
    - Low Tint Strength
    - Produce colors low in Chroma; not bright in appearance

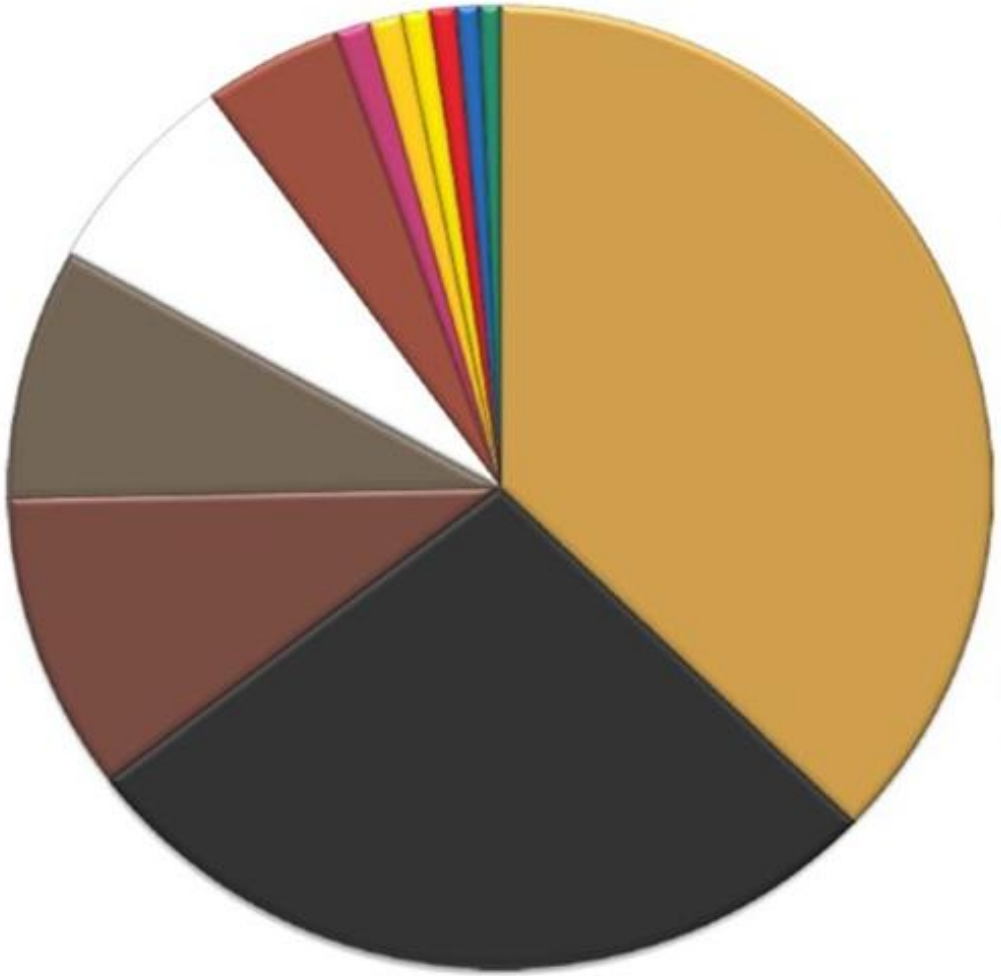
ORGANIC COLORANTS

- **Good Performing Colorants**
  - **Benefits**
    - Produce Bright, Clean & Vivid colors
    - Produce High Chromatic colors
    - High Tint Strength
  - **Drawbacks**
    - Higher in Cost
    - Poor Light Fastness
      - Differs throughout all organic colorants
    - Sensitive to High Heat
    - Low Opacity / Hiding
    - Poor Alkali resistance
      - E – Phthalo Blue most sensitive
    - Fade warning required

CORE COLORANTS

- Colorant usage based on trending color demand in North America

The best performing pigments make up over 90% of the overall pigment consumption.



GREEN PANELS – WEATHERED
Q-SUN EXPOSURE TIME – 2000 HOURS

MULTIPLE TINT BASE SYSTEM

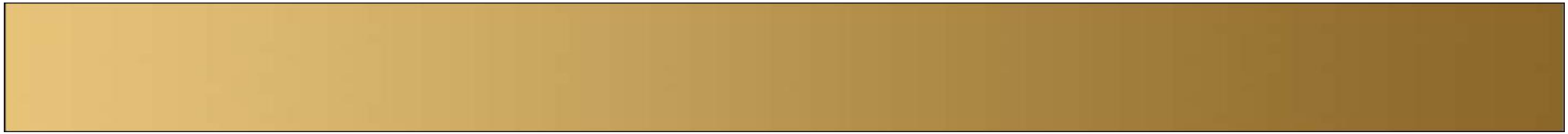
- **Each Tint Base Differs in Content of Primary White Pigment (TiO_2):**

- Pastel Tint Base
  - High TiO_2 content
  - Designed for low colorant additions
  - Provides high hide
  - Used for colors with LRV > 45%

MULTIPLE TINT BASE SYSTEM

- **Each Tint Base Differs in Content of Primary White Pigment (TiO_2):**

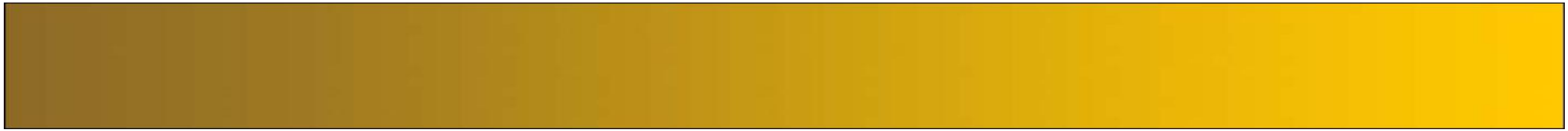
- Medium Tint Base
  - Mid range TiO_2 content
  - Relatively low colorant additions
  - Less hiding power then Maxi White
  - Used for colors with LRV > 30%



MULTIPLE TINT BASE SYSTEM

- **Each Tint Base Differs in Content of Primary White Pigment (TiO_2):**

- Ultra Deep Tint Base
  - Low TiO_2 content
  - Designed for high colorant additions
  - Poor hiding without the addition of colorant
  - Used for colors with LRV > 15%



MULTIPLE TINT BASE SYSTEM

- **Each Tint Base Differs in Content of Primary White Pigment (TiO_2):**

- Neutral Tint Base
  - No TiO_2 content
    - Some formulas may require the addition of KX colorant
  - Designed for high colorant additions
  - No hiding power
    - Minimum addition of colorant required
  - Used for the darkest and most pure colors

COST OF COLOR

Medium Tint Base
The intended tint base
$7.69

Deep Tint Base
$9.45

Clear Tint Base
$19.34

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TINT BASE MINIMUM AND MAXIMUM COLORANT LIMITS

*MINIMUM REQUIRED					*MAXIMUM LIMIT			
Quart			2-Quart		Quart		2-Quart	
Tint Base	OZ	48ths	OZ	48ths	OZ	48ths	OZ	48ths
Pastel	0	0	0	0	1	0	2	0
Medium	0	12	0	24	1	24	3	0
Ultra-Deep	1	0	2	0	2	0	4	0
Neutral	1	24	2	24	2	24	5	0

*MINIMUM REQUIRED					*MAXIMUM LIMIT			
Gallon			5 Gallons		Gallon		5 Gallons	
Tint Base	OZ	48ths	OZ	48ths	OZ	48ths	OZ	48ths
Pastel	0	0	0	0	4	0	20	0
Medium	1	0	5	0	6	0	30	0
Ultra-Deep	4	0	20	0	8	0	40	0
Neutral	6	0	30	0	10	0	50	0

Sika Thorocoat 350 Aquasol Only

*MINIMUM REQUIRED					*MAXIMUM LIMIT			
Gallon			5 Gallons		Gallon		5 Gallons	
Tint Base	OZ	48ths	OZ	48ths	OZ	48ths	OZ	48ths
Pastel	0	0	0	0	4	0	20	0
Medium	1	0	5	0	6	0	30	0
Ultra-Deep	4	0	20	0	8	0	40	0
Neutral	6	0	30	0	10	0	50	0

COLOR SAMPLES

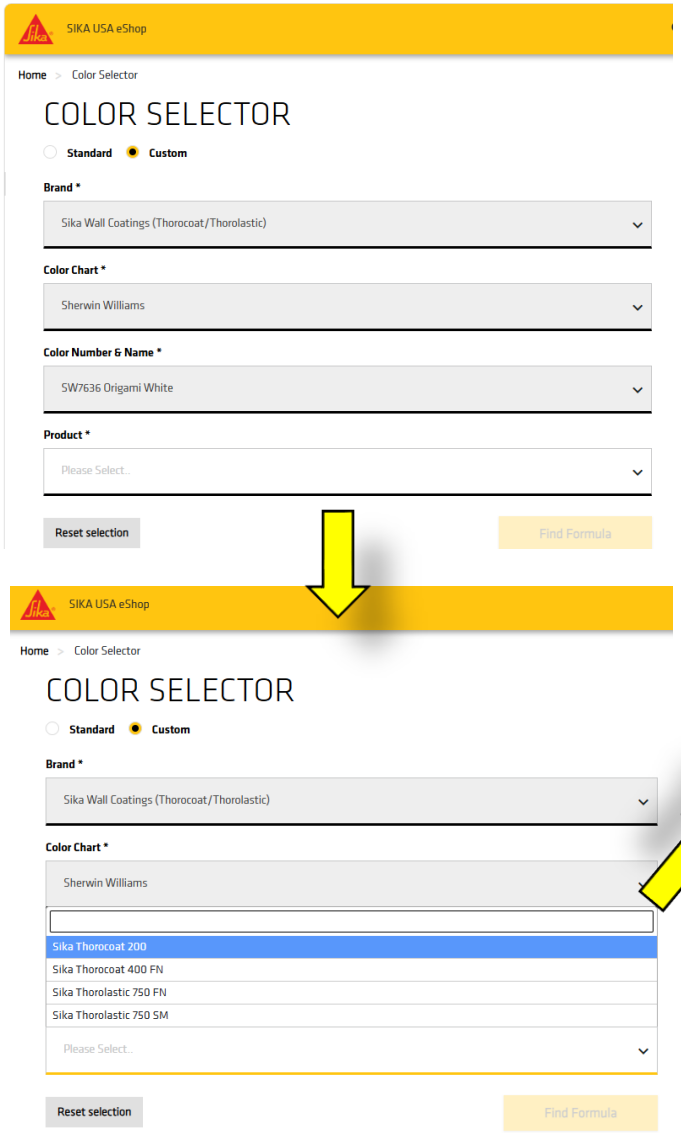
- If possible, always obtain a sample the Contractor or Architect is referencing for the Job.
  - Colors can vary from Color Card print dates.
  - Age of color reference can be much older than the National Color Lab is referencing
  - Not possible to get a good reading to generate a color formula.
    - Very difficult to visually access color match to target

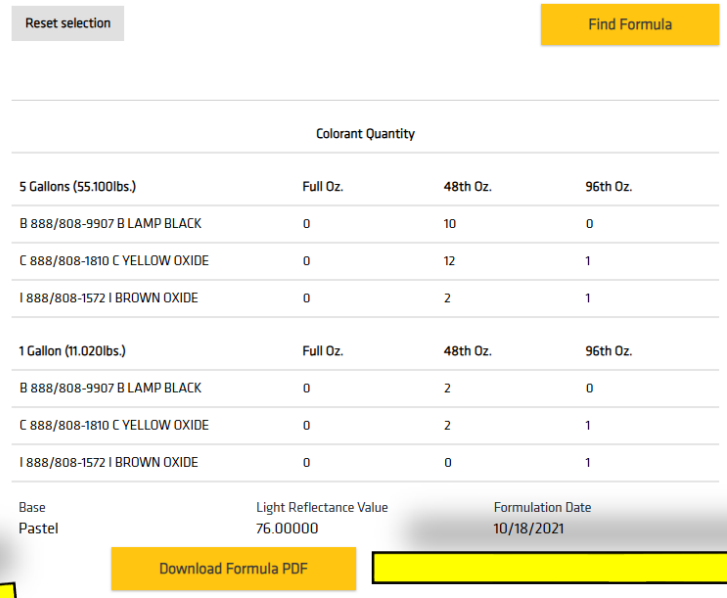
Sika Tint Manual

40 pages
of
Resource Material
for
Tint Department

Table of Contents

SIKA ESHOP COLOR SELECTOR





ColorLogic

Standard Color Formulation Sheet

BUILDING TRUST

Color information

Color Chart : Sherwin Williams
Color Number & Name : SW7636 Origami White
Light Reflectance Value : 76.00000 %
Product : Sika Thorolastic 750 SM
Base : Pastel
Formulation Date : 10/18/2021

5 gallons (55.100lbs.) ***	Colorant Quantity		
	Full oz.	48th oz.	96th oz.
B 888/808-9907 B LAMP BLACK	0	10	0
C 888/808-1810 C YELLOW OXIDE	0	12	1
I 888/808-1572 I BROWN OXIDE	0	2	1

1 gallon (11.020lbs.)	Colorant Quantity		
	Full oz.	48th oz.	96th oz.
B 888/808-9907 B LAMP BLACK	0	2	0
C 888/808-1810 C YELLOW OXIDE	0	2	1
I 888/808-1572 I BROWN OXIDE	0	0	1

Special Notes:

*** This 5 gallon formula cannot be evenly scaled due to container size restrictions. Therefore samples tinted from the gallon formula may produce a slightly different color.

Using this formula:

Mix one pail only, stop and confirm that an air-dried sample meets your requirements. If it does not, adjust the formula or contact Customer Service before proceeding further.

Liability is limited to the first pail tinted with this formula. Final appearance (color and texture) is dependent on several factors including dispensing equipment, drying conditions and application technique.

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COLOR REQUEST FORMS

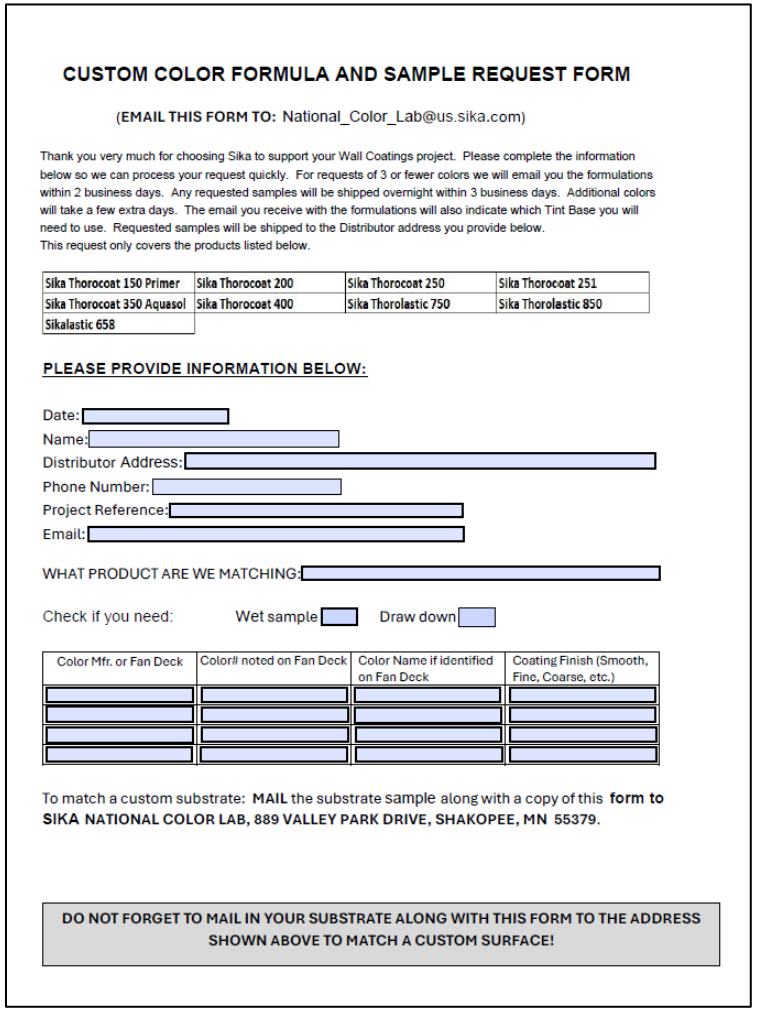
IMPORTANT!!!

Always send your physical samples Attention: National Color Lab. Not doing so will delay your request.

- **Color Formula Request Form**
  - When requesting a color formula
  - Specify the Specific Finish or Coating you need the color match
  - All incoming requests for color matches have a specific lead time determined by the quantity of color matches requests.
  - Draw Downs of Sika Coatings requested can be provided for the custom color matches

STANDARD COATINGS REQUESTS		
Number of Requested Formulas	Days to Complete	
	Formula Only	1-10 Draw Downs
1 to 3	2	3
4 to 6	3	4
7 to 9	4	5
Existing Formula	1	2

* For requests that fall outside the scope of this matrix, lead times will be determined by the color lab supervisor, and the revised lead time will be communicated.



CUSTOM COLOR FORMULA AND SAMPLE REQUEST FORM

(EMAIL THIS FORM TO: National_Color_Lab@us.sika.com)

Thank you very much for choosing Sika to support your Wall Coatings project. Please complete the information below so we can process your request quickly. For requests of 3 or fewer colors we will email you the formulations within 2 business days. Any requested samples will be shipped overnight within 3 business days. Additional colors will take a few extra days. The email you receive with the formulations will also indicate which Tint Base you will need to use. Requested samples will be shipped to the Distributor address you provide below.
This request only covers the products listed below.

Sika Thorocoat 150 Primer	Sika Thorocoat 200	Sika Thorocoat 250	Sika Thorocoat 251
Sika Thorocoat 350 Aquasol	Sika Thorocoat 400	Sika Thorolastic 750	Sika Thorolastic 850
Sikalastic 658			

PLEASE PROVIDE INFORMATION BELOW:

Date:
Name:
Distributor Address:
Phone Number:
Project Reference:
Email:

WHAT PRODUCT ARE WE MATCHING:

Check if you need: Wet sample Draw down

Color Mfr. or Fan Deck	Color# noted on Fan Deck	Color Name if identified on Fan Deck	Coating Finish (Smooth, Fine, Coarse, etc.)

To match a custom substrate: **MAIL** the substrate sample along with a copy of this **form to SIKA NATIONAL COLOR LAB, 889 VALLEY PARK DRIVE, SHAKOPEE, MN 55379.**

DO NOT FORGET TO MAIL IN YOUR SUBSTRATE ALONG WITH THIS FORM TO THE ADDRESS SHOWN ABOVE TO MATCH A CUSTOM SURFACE!

datacolor

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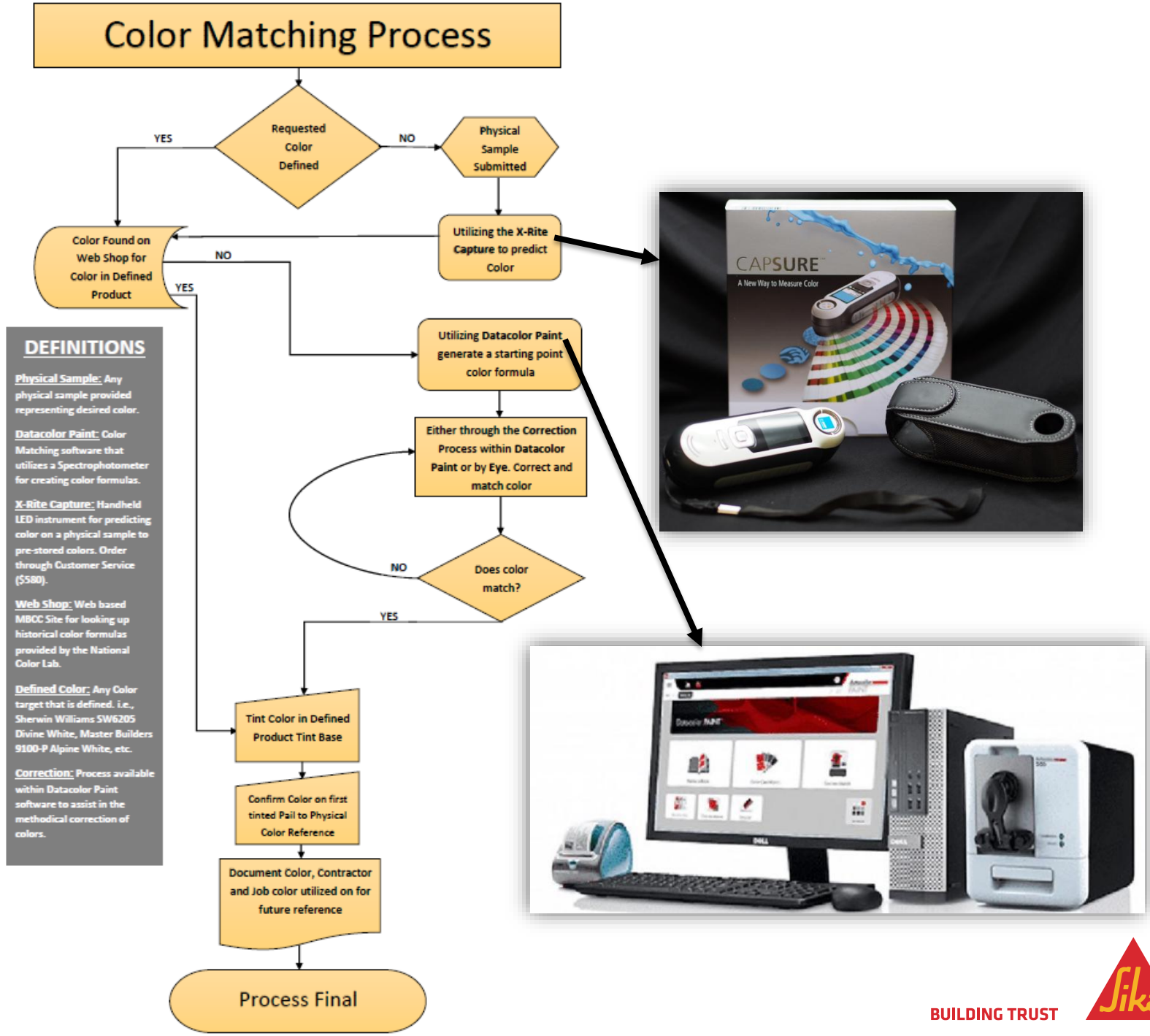
On-Site Custom Color Matching

- On-Site custom color matching
- Sales cycles shortened for you and your customer
- Physical sample color matching, including textured samples
- Ability to measure a wide range of samples
- Quick color lookup of standard colors
- 1000's of competitor color matches
- Capability to capture and save historical color formula with ease of retrieval

Color Matching Process



DEFINITIONS

Physical Sample: Any physical sample provided representing desired color.

Datacolor Paint: Color Matching software that utilizes a Spectrophotometer for creating color formulas.

X-Rite Capture: Handheld LED instrument for predicting color on a physical sample to pre-stored colors. Order through Customer Service ($580).

Web Shop: Web based MBCC Site for looking up historical color formulas provided by the National Color Lab.

Defined Color: Any Color target that is defined. i.e., Sherwin Williams SW6205 Divine White, Master Builders 9100-P Alpine White, etc.

Correction: Process available within Datacolor Paint software to assist in the methodical correction of colors.

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206
303
201
103