

SHADE MATCHING

The Principles and Applications of Matching Today's Sophisticated Esthetic Materials

A P u b l i c a t i o n b y A d D e n t , I n c .

References included:

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Mark Pitel, Fay Goldstep and George Freedman



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INTRODUCTION:

The importance of accurate shade matching has increased over the years with improvements in materials and the expectations of the patients. Patient's today expect an aesthetically pleasing and clinically successful result. This places more pressure on the Clinician to get it right the first time, keeping the patient happy and expenses down.

Determining an accurate shade match is one of the most critically important procedures in aesthetic restorative dentistry and has always been one of the greatest challenges in clinical dentistry.

– Lorin Berland, DDS

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CHAPTER ONE:

CHALLENGES IN SHADE MATCHING



There are a several challenges that can interfere with accurate shade matching. Poor Lighting, type of shade guide being used, taking too long to select a shade (causing errors in judgement), taking shades when tired, oversaturated background effecting what you perceive, and the list can go on.

These challenges are many but not impossible to overcome.

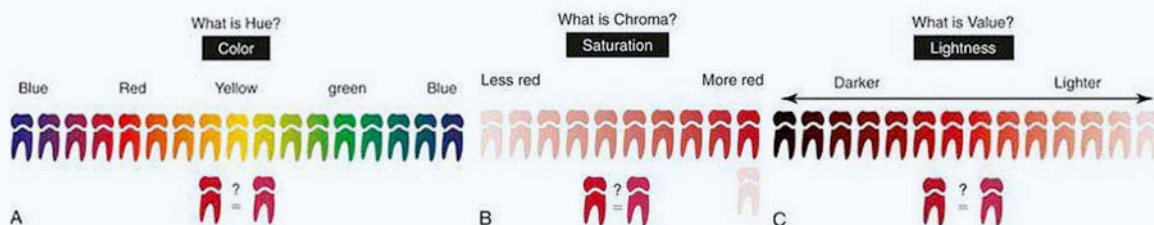
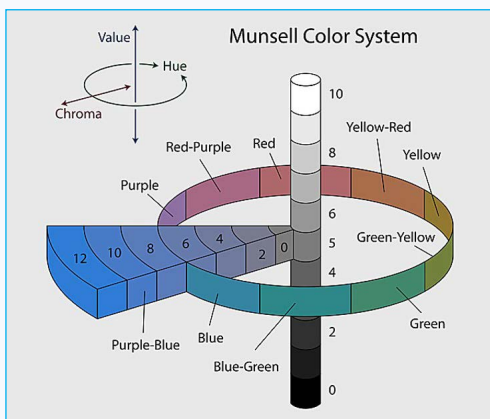
“Success is simply that one restoration matches the other. At the end of the day, our patients aren’t dentists; all they want to know is whether the restorations match or not. In the end, we’re trying to get rid of subjectivity and eliminate the optical illusions.”¹

CHAPTER TWO:

ELEMENTS OF A SHADE

Shade matching is more than just getting the right color (hue) and Chroma (saturation). The most important variable is the value. This is why selecting the correct value (relative lightness or darkness of the hue) of a shade is critical. If the value is accurate, any discrepancies in the Chroma or hue may well be unnoticeable.²

Reflectiveness and translucence combined determine the appearance of a tooth. Reflective properties are especially important for shade matching because this is the true definition of 'value.' Value tends to be defined as the coloring on a range of white to grey, but it's actually a measure of tooth reflectiveness.³

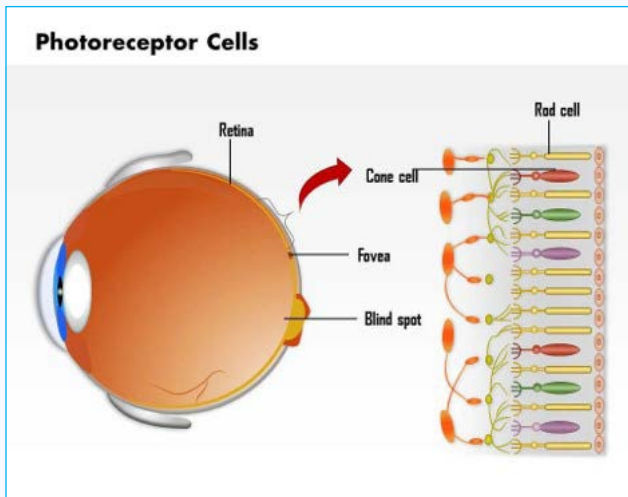


There are other aspects of a tooth that should be given attention.

Natural teeth exhibit translucency, fluorescence and opalescence, information which is necessary for successful shade matching.⁴

CHAPTER THREE:

SHADE TAKING PRACTICES



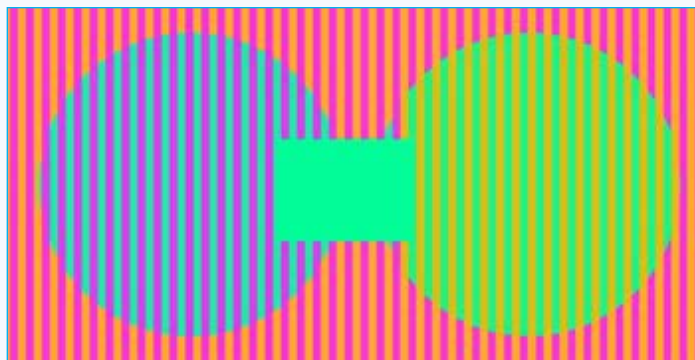
Shade selection should always be the first step of the appointment. This assures that the patient's tooth isn't desiccated, and the Dentist's eyes are not too tired.

The eye has approximately 6 to 7 million cone cells to see color compared to approximately 120 million rod cells that help us see brightness. The cone cells fatigue quickly, and it is important to not focus too long on finding hue of a tooth.

Second guessing yourself can be a sign that your eyes need a rest, this can be done by changing your gaze to a neutral color like a wall to allow the cone cells to recover.

It is recommended that the shade-matching be conducted with a neutral background that has no complimentary color and is restful to the eyes' retinal.

Bright colors adjacent to the teeth to be shade-matched can cause perceptual problems: lipstick, bright clothing or jewelry, anything that will cause the color receptors of the eye to overcompensate and result in distorted evaluation of the hue. Should be either removed or covered with a neutral grayish bib.⁵



CHAPTER THREE:

WHAT LIGHTING IS BEST FOR SHADE TAKING?



CRI = 51

The standard for lighting used in selecting a shade is 5500°K but it should also have a CRI of 90 or more.

What is CRI? Color Rendering Index, which is the rating of how close a light is to reproducing what you would see in natural sunlight. The higher the CRI the better the color rendering of the light.

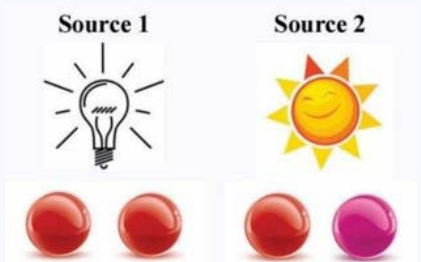


CRI = 80

Metamerism: Two colors that appear to match under a given lighting condition but have different spectral reflectance are called metamers, and the phenomenon is known as metamerism. The problem of metamerism can be avoided by selecting a shade and confirming it under different lighting conditions, such as natural daylight and fluorescent light⁸ This is exactly what we do with the Rite Lite Pro which offers 4 distinctly different lighting environments



CRI = 90



Once you have your patient prepared, the lighting and shade guide (it is recommended that the shade guide offer different values for each shade).

CHAPTER THREE:

SELECTING THE SHADE

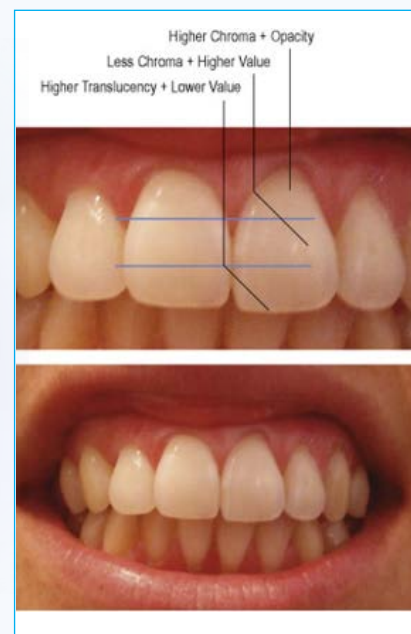
- First choose your shade **Value (brightness) then the Hue (color) and Chroma (intensity/saturation)**

An increase in Chroma or Color saturation will decrease the Value.

Be very clear about what is value and what is chroma. When you think darker (value) and not deeper color (chroma) you may end up with dull restoration.

Other aspects of the tooth appearance that are necessary when shade mapping:

- **Translucency** = How much light the tooth allows to pass through it.
- **Opalescence** = The reflection of iridescent light which makes teeth appear to have varying colors especially in different light.
- **Fluorescence** = How teeth absorb and radiate color back to the viewer.⁶



CHAPTER THREE:

SHADE MAPPING

Traditional shade taking involves matching one or more selected colors from a range of shade tabs to the teeth adjacent or contralateral to the teeth to be restored. The more information (and accuracy) that the dentist can provide in the prescription, the more lifelike the technician's output can become. Thus, the dentist who provides a drawing of a tooth color map, indicating the various shades within the tooth and their borders, is more likely to have a positive result than the dentist who describes the shade as a single generic color.



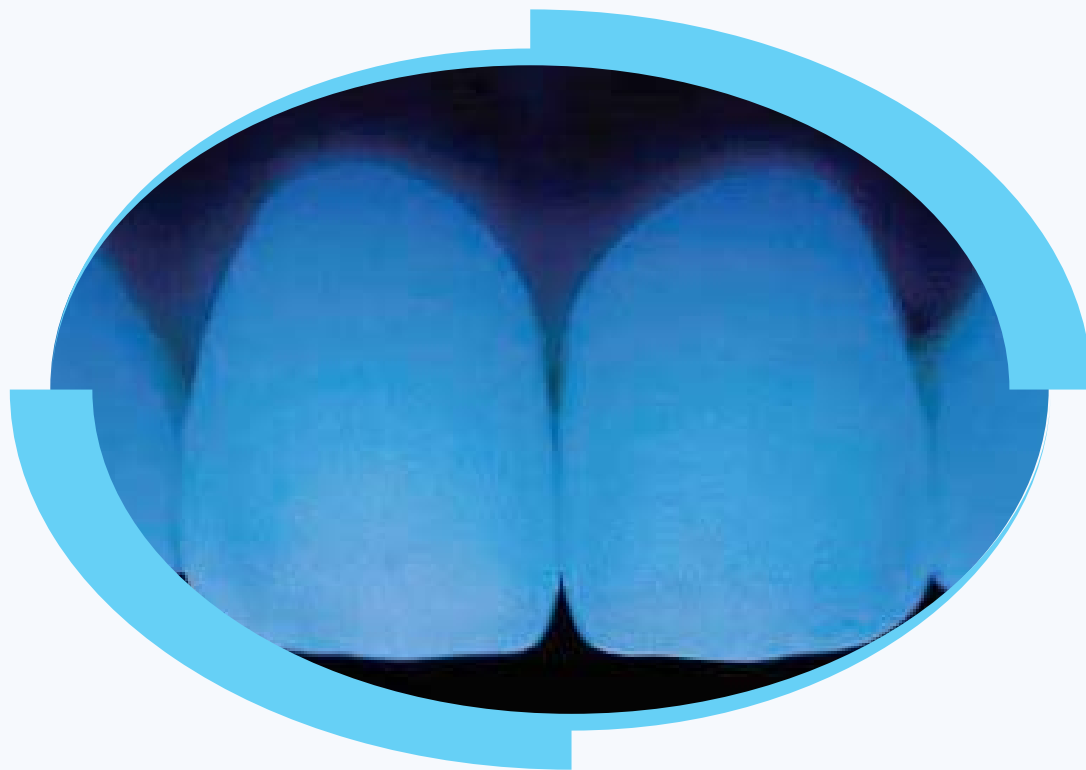
White Spot Lesion as shown with Microlux 2 Transilluminator

CHAPTER THREE:

FLUORESCENCE IS A VITAL TO MIMIC NATURAL TEETH

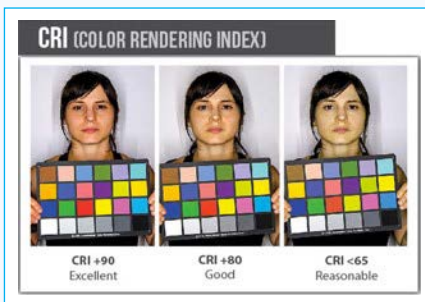
Shade and translucency matching are fundamental aspects in esthetic dentistry. The ultimate goal is to create tooth-like restorations; however, natural teeth also show fluorescence, which must be simulated to achieve ideal esthetic results.⁷

Fluorescence is considered a clinically significant optical property in esthetic restorations because it is why teeth appear whiter and brighter, emitting more-light than they receive. Ambient UV irradiation emits autofluorescence that is responsible for the “vital” tooth appearance.¹⁰



CHAPTER FOUR:

RITE-LITE PRO MULTI-SPECTRAL/ HI CRI SHADE LIGHT FOR PERFECT SHADE MATCHING



Rite-Lite PRO Shade Matching Unit with HI-CRI LED's is a device that answers all your needs for Shade Taking.

The HI CRI L.E.D. are rated at 90+ and with three modes of light to simulate various lighting conditions. The Dentist can verify their shade choice and assure that the phenomenon of Metamerism is not affecting the end result.

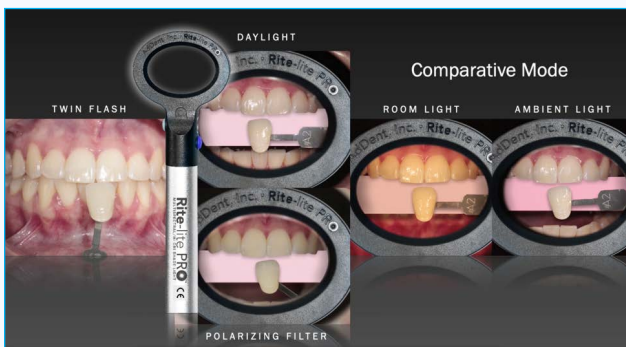
Rite-Lite PRO offers three modes of light for shade taking:

1. Color-corrected light at a color temperature of 5500° Kelvin.
2. Incandescent – room light at 3200° Kelvin. This is found in many indoor environments
3. Ambient light at 3900° Kelvin. This is a combination of room light and daylight.

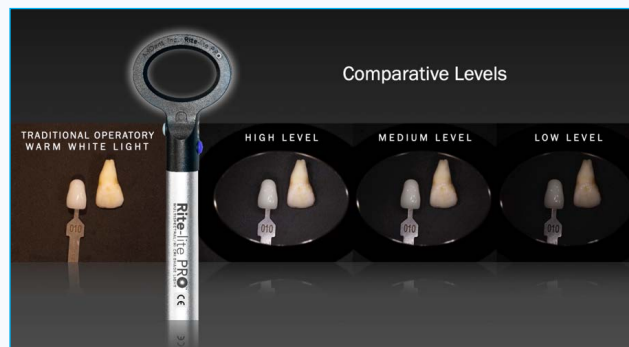
RITE-LITE PRO OFFERS THREE LEVELS OF LIGHT INTENSITY FOR BETTER VISUALIZATION.

To Use:

Choose shade at 5500° K. Verify the selected shade using 3200° K (incandescence) and 3900° K (ambient). Shade should match in all color temperatures. Adjust light intensity as dictated by the procedure.



Twin flash photo vs images taken with Rite-Lite PRO using different light settings and the optional Polarizing Filter.



Demonstration of the three different light intensity settings of the Rite-Lite PRO

CHAPTER FOUR



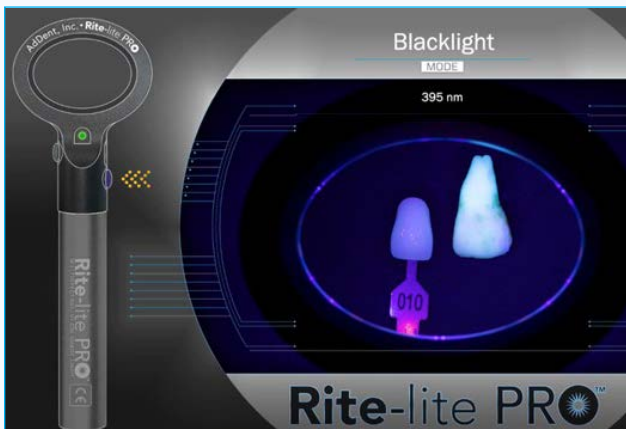
BLACK LIGHT SETTING FOR MATCHING RESTORATIONS TO NATURAL DENTITION FLUORESCENCE

Research shows that natural teeth fluoresce at wavelengths below 400 nm, i.e. - black light.

Wavelengths below 400 nm are part of the spectrum of various indoor and outdoor lighting environments.

Therefore, if we are to get a perfect shade match for porcelain or composite materials, they should fluoresce in the same manner as natural teeth.

The cell phone photos show the effect of this mismatch when viewed with the Rite-Lite PRO.



RITE-LITE PRO WITH POLARIZING FILTER

The Polarizing Filter Attachment for the Rite-Lite PRO aids shade selection by eliminating reflection. Providing enhanced visualization of tooth for color, depth, and transparencies.

The polarizing filter will also enhance the visualization of internal details and surface anomalies.



CONCLUSION:

The clinical importance of correct shade selection in aesthetic dentistry cannot be overemphasized.

Patient's expectations for aesthetically pleasing and clinically successful restorations make getting it right the first time critical. Understanding how various light and color properties influence shade and knowing how to adjust for these variables, makes accurate shade selection consistently successful.



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Images courtesy of: Dr. Enrique Kogan, Dr. Delfin Baquero, Dr. Lorin Berland, Dr. Mark Pitel, VITA Zahnfabrik and other web sources

PERFECTING SHADE SELECTION

Rite-lite PRO™ MULTISPECTRAL/HI CRI SHADE LIGHT



- Multi-Spectra HI CRI LEDs (5500°k, 3200°k, 3900°k)
- Three intensity levels
- Blacklight setting for matching restorations to natural dentition fluorescence
- Larger viewing area
- Rechargeable Li-Ion battery
- Available Polarizing Filter eliminates reflection



Clinical View



Black Light View

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