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F.C.O.V.D., F.C.S.O.

## INTRODUCTION TO BASIC SYNTONIC SYNDROMES

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## Disclosure

- I have no financial interest in any of the items, methods, or equipment mentioned in this lecture



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Syntonics 101

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## Basic Syntonic Syndromes

- Will cover 90-95% of cases
- What caused the stress?
- Treat the problem, not the symptom

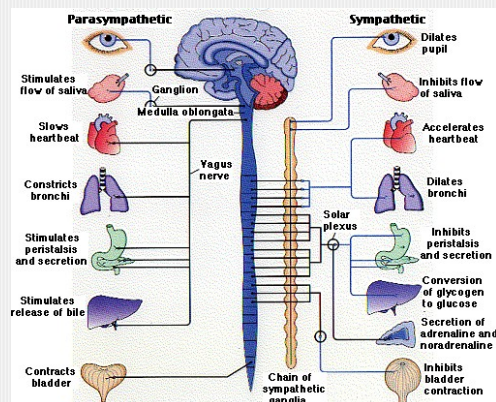
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## The Autonomic Nervous System

Sympathetic and Parasympathetic

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## Sympathetic Actions

- Dilates the pupil
- Increases tearing
- Increases intraocular pressure
- Decreases accommodation
- Turns eye outward

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## Sympathetic Actions

- Decreases mucus, saliva and digestion
- Decreases arterial dilation
- Increases pulse rate
- Increases blood pressure
- Increases blood sugar

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## Sympathetic Activation

- Thyroid
- Adrenal Medulla
- Pituitary
- Gonads
- Muscles

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## Post-Traumatic Vision Syndrome

- Exophoria/exotropia
- Reduced accommodation
- Reduced convergence
- Poor blink rate / poor tearing
- Photophobia

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## Parasympathetic Actions

- Pupil constriction
- Decreases tearing
- Decreases intraocular pressure
- Increases accommodation
- Turns eye inward

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## Parasympathetic Actions

- Increases mucus, saliva and digestion
- Decreases pulse rate
- Increases arterial dilation
- Decreases blood pressure
- Decreases blood sugar

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## Parasympathetic Activation

- Parathyroids
- Adrenal cortex
- Digestive tract
- Liver
- Pancreas
- Spleen

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## Light Action on the Visual System

- Light Pathways
- Effect on Autonomic Nervous System
- Frequencies of light and how they affect the visual system

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## Light Pathways

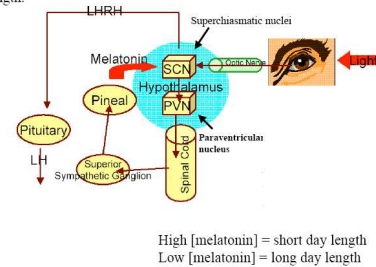
- Nonvisual photoreceptors of the deep brain, pineal gland and retina
- Hypothalamus: suprachiasmatic nucleus>pituitary
- Pituitary: ACTH to adrenal gland  
>cortisol/stress hormone
- Pineal: melatonin production
- Retina: influences suprachiasmatic nucleus
- Intrinsically photosensitive retinal ganglion cells

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- **Intrinsically photosensitive Retinal Ganglion Cells (ipRGCs)**, also called **photosensitive Retinal Ganglion Cells (pRGC)**, or **melanopsin-containing retinal ganglion cells**, are a type of neuron (nerve cell) in the retina of the mammalian eye. While responses to light in mice lacking rods and cone cells were first noted in 1923,<sup>[1]</sup> they were forgotten, then rediscovered in the early 1990s.<sup>[2]</sup> The source of these responses was shown to be a special type of retinal ganglion cell, which, unlike other retinal ganglion cells, is intrinsically photosensitive. This means that they are a third class of retinal photoreceptors, excited by light even when all influences from classical photoreceptors (rods and cones) are blocked (either by applying pharmacological agents or by dissociating the ganglion cell from the retina). Photosensitive ganglion cells contain the photopigment melanopsin. The giant retinal ganglion cells of the primate retina are examples of photosensitive ganglion cells.

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The pineal gland secretes melatonin and is a representation of day length.



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www.icrp.edu/programs/lightHealth/research.asp

**Lighting Research Center**  
Advancing the effective use of light for society and the environment

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**Light and Health**

Light and Health Home  
Research Projects  
Light and Health Education  
Publications  
Media  
Sponsors  
Light and Health Alliance

**Research Projects**

Recent research has shown that light:

- Alleviates seasonal depression.
- Increases the length and quality of sleep.
- Consolidates sleep/wake patterns in Alzheimer's disease patients.
- Improves the performance of night and workers.
- Improves weight gain in premature infants.
- Regulates melatonin, which has been shown to reduce breast cancer growth in animals.
- Has a direct impact on critical brain activity.

The Lighting Research Center has conducted numerous studies to investigate the impact of light on human health and wellbeing. The work performed by LRC researchers consists of basic, applied, field, and measurement research, many in partnership with the program's Sponsors and the Light and Health Alliance. The studies listed below represent only a portion of the important scientific findings that raise questions about the health impact of lighting used in offices, schools, and homes.

**Research Areas**

**Light and Older Adults**

LRC researchers are studying issues that affect older adults, such as postural control and stability, light therapy for mitigating symptoms of Alzheimer's disease, reactivity patterns of healthy adults vs. Alzheimer's patients, and lighting design for the aging eye.

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## Current Research

Google

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**Journal Reference**

1. Mohab M. Ibrahim, Amol Patwardhan, Kerry B. Gilbrath, Aubin Moutal, Xiaodong Yang, Lindsey A. Chew, Tally Largent-Milnes, T. Philip Malan, Todd W. Vanderlin, Frank Porroica, Rajesh Khanna. **Long-lasting antidepressant effects of green light in acute and chronic pain in rats.** *PAIN*, 2017, 158 (2): 347  
DOI: 10.1016/j.pain.2016.09.027

"THE" Vestibular Course - 16 hrs COPE approved course  
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INSTRUCTORS: Carla Eastman, OD and Jason Cupton, OD  
May 15-21, 2018  
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CONTACT: Gabe Marshall, OD 361-323-3927

National Congress of Optometry  
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Google Patents

**Red to near-infrared photobiomodulation treatment of the visual system in visual system disease or injury**  
US 7354432 B2

**ABSTRACT**  
A method of treating visual system disease is disclosed. One embodiment comprises the steps of (a) exposing a component of a patient's visual system to light treatment, wherein the light treatment is characterized by wavelength of between 630-1000 nm and power intensity between 10-50 mW/cm<sup>2</sup> for a time of 1-3 minutes, and (b) observing restoration of visual system function.

**Publication number** US7354432 B2  
**Publication type** Grant  
**Application number** US 10/758,793  
**Publication date** Apr 8, 2008  
**Filing date** Jan 16, 2004  
**Priority date** Jan 17, 2003  
**Fee status** Paid  
**Also published as** US7744060, US20040215293, US20060050589  
**Inventors** Jans T. Eells, Margaret T. T. Wong-Riley, Harry T. Whelan  
**Original Assignee** Mow Research Foundation, Inc.  
**Export Citation** BiBTeX, EndNote, RefMan  
**Patent Citations (14)**, **Non-Patent Citations (48)**, **Referenced by (34)**, **Classifications (8)**, **Legal Events (4)**  
**External Links:** USPTO, USPTO Assignment, Espacenet

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journal homepage: www.elsevier.com/locate/ynbdi

**A randomized, double-blind, placebo-controlled trial of blue wavelength light exposure on sleep and recovery of brain structure, function, and cognition following mild traumatic brain injury**

William D.S. Killgore<sup>a</sup>, John R. Vanuk, Bradley R. Shane, Maren Weber, Sahil Bajaj  
<sup>a</sup>Department of Psychiatry, College of Medicine, University of Arizona, United States of America

**ARTICLE INFO**

**Keywords:**  
 nTBI  
 Circadian  
 Light therapy  
 Blue light  
 Sleep  
 Circadian rhythms  
 Neuroimaging  
 DTI  
 VBM

**ABSTRACT**  
 Sleep and circadian rhythms are among the most powerful but least understood contributors to cognitive performance and brain health. Here we capitalize on the circadian evening effect of blue-wavelength light to phase shift the sleep patterns of adult patients (aged 18–64 years) recovering from mild traumatic brain injury (mTBI), with the aim of facilitating recovery of brain structure, connectivity, and cognitive performance. During a randomized, double-blind, placebo-controlled trial of 32 adults with a recent mTBI, we compared 6 weeks of daily 30-min pulses of blue light (peak λ = 460 nm) each morning versus amber placebo light (peak λ = 578 nm) on neuroimaging and neurocognitive outcomes, including gray matter volume (GMV), resting-state functional connectivity, directed connectivity using Granger causality, and white matter integrity using diffusion tensor imaging (DTI). Relative to placebo, morning blue light led to phase-advanced sleep timing, reduced

## Photobiomodulation

**HHS Public Access**  
 Author manuscript  
 Published in final edited form as:  
 IEEE J Sel Top Quantum Electron. 2016; 22(5): 1010–1019. doi:10.1109/JSTQE.2016.2561201.

**Proposed Mechanisms of Photobiomodulation or Low-Level Light Therapy**  
 Lucas Freitas de Freitas<sup>1,2</sup> and Michael R. Hamblin<sup>3,4,\*</sup>  
<sup>1</sup>Programa de Pós-Graduação em Engenharia Biomédica, University of São Paulo, São Carlos - SP, Brazil  
<sup>2</sup>Wellman Center for Photomedicine, Harvard Medical School, Boston, MA 02114, USA  
<sup>3</sup>Department of Dermatology, Harvard Medical School, Boston, MA 02115, USA  
<sup>4</sup>Harvard MIT Division of Health Sciences and Technology, Cambridge, MA 02139, USA

**Abstract**  
 Photobiomodulation (PBM) also known as low-level laser (or light) therapy (LLLT), has been known for almost 50 years but still has not gained widespread acceptance, largely due to uncertainty about the molecular, cellular, and tissue mechanisms of action. However, in recent years, much knowledge has been gained in this area, which will be summarized in this review. One of the most important characteristics is cytochrome c oxidase (and TP as the mitochondrial respiratory chain), which converts both laser and non-laser sources and directs light into the same, activated region. The leading hypothesis is that the photons dissociate inhibitory nitric oxide from cytochrome c oxidase, which is then converted to nitric oxide, which is then released into the tissue and acts as a vasodilator.

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## Balance Board – general considerations

**NEUTRALIZATION KEY**

Stimulate Sympathetic			Syntony	Stimulate Parasympathetic		
αδ	αθ	α	δ	θ	μθ	μδ
μ	μ	μ	μ	μ	μ	μ
μπ	π	ω	ν	πω	ωω	

Add "S" to augment this side Flash

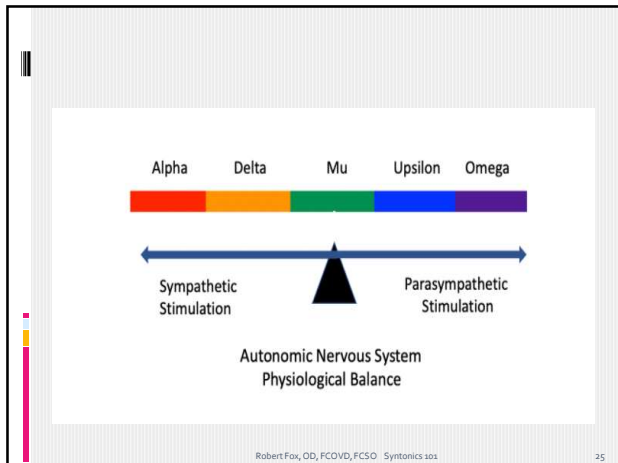
Add "D" to augment this side No Flash

Red end of spectrum= sympathetic stimulation

Blue end of spectrum= parasympathetic stimulation

**Red = sensory stimulant**  
**Orange = motor stimulant**  
**Yellow = intense motor stimulant**  
**Green equalizes for physiological balance**  
**Blue = sensory depressant**  
**Indigo = motor depressant**  
**Violet = intense sensory depressant**

**α alpha = red**  
**δ delta = amber**  
**μ mu = green**  
**υ upsilon = blue**  
**ω omega = indigo**



## The “Miracle Workers”

- Chronic Syndrome
- Acute Syndrome
- Amblyopia/Esotropia Syndrome
- Emotional / Adrenal Exhaustion Syndrome

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SYNTONIC COLOR NAMES		
Red-Orange	αδ	Alpha Delta – “Lazy Eye Syndrome” amblyopia, eso, poor accommodation
Yellow-Green	μδ	Mu Delta – “Chronic Syndrome” physiological, toxic, neuroendocrine chronic imbalance, allergy
Blue-Green	μν	Mu Upsilon – “Acute Syndrome” recent head trauma, high fevers, inflammation swelling, pain, HA, monocular diplopia
Indigo	υω	Upsilon Omega – “Pain Reliever” headaches, asthenopia
Ruby	αω	Alpha Omega – “Emotional Fatigue” poor coping, mood swings, too pupil, frustration, adrenal fatigue
Alpha	α	= red
Delta	δ	= amber
Mu	μ	= green
Upsilon	ν	= blue
Omega	ω	= cobalt

$\frac{H_{110^\circ}/H_{330^\circ}}{H_{210^\circ}/H_{330^\circ}} = \frac{1}{2}$

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## Mu Delta – “Chronic Syndrome” physiologic stabilizer

Dx: convergence excess, esophoria/esotropia  
alpha omega pupil and poor oculomotor  
constricted visual field for form or color  
low recovery on ductions (especially BI)

Sx: toxic or neuroendocrine imbalance  
chronic health problems or past trauma

Tx: stimulate sympathetic, create exo response

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## Alpha Omega – “Emotional Fatigue” Syndrome



Dx: alpha omega pupil, fatigue exo, low breaks  
and recoveries (especially BO), adrenal fatigue

Sx: photophobia, transient blurred vision,  
fatigue, headache

Tx: balance parasympathetic and sympathetic

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## Treatment Protocol (end at middle of spectrum)

 Alpha Omega  
+  
 Mu Delta  
**Lemon**

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## ● Alpha Delta – “Amblyopia Syndrome”

**Red-Orange** sensory + motor stimulant

Dx: amblyopia, esotropia, poor accommodation, constricted visual field, reduced vergence ranges

Sx: reduced acuity on one eye, head tilt or turn, poor depth judgment, diplopia  
also slow reading speed and poor handwriting

Tx: stimulate sympathetic  
especially in long standing strabismus

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## ● Alpha Delta – “Amblyopia Syndrome”

**Red-Orange** amblyopia, eso,  
poor accommodation

● **Mu Delta** – “Chronic Syndrome”  
**Lemon** physiological, toxic,  
neuroendocrine

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## Why Red-Orange or Lemon ?

- Sympathetic Activation
- Sensory and Motor Stimulant
- For amblyopia, esotropia
- Stimulates Exo Response

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## Treatment Protocol (end at middle of spectrum)

● **Red-Orange** Alpha Delta  
+  
● **Lemon** Mu Delta

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## Nascentization

- Usually used for amblyopia
- Local vs Non-Local
- Red lens over non-dominant eye
- Syntonizer just has diffusing filter
- Do for 3 minutes prior to syntonetic treatment



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● **Alpha Omega** – “Emotional Fatigue”  
**Ruby** pupil, adrenal fatigue, emotional  
trauma, exhaustion, mood swings

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## Color Combinations

- Alpha Delta + Mu Delta (esotropia)
- Alpha Omega + Mu Delta (80% of cases)
- Alpha Omega (alone)

Always end at the middle of the balance board

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## Mu Upsilon – “Acute Syndrome”

**Blue-Green** recent head trauma, anoxia, stroke

Dx: exophoria, exotropia, convergence insufficiency (PTVS), alpha omega pupil, enlarged blind spot, poor ocm / accommodation

Sx: headache, motion sickness, vertigo, transient blurred vision, diplopia (monocular)

Tx: stimulate parasympathetic

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## Why Indigo or Blue-Green ?

- Parasympathetic Activation
- Sensory and Motor Depressant
- For Pain and Spasm
- Stimulates Eso Response

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**Indigo**

## Upsilon Omega – “Pain Reliever”

not a syndrome

headaches, asthenopia

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**Blue-Green**

## Mu Upsilon – “Acute Syndrome”

recent head trauma, high fevers, inflammation, swelling, pain, HA, monocular diplopia



**Indigo**

(Violet)

## Upsilon Omega – “Pain Reliever”

headaches, asthenopia

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## Treatment Protocol (end at middle of spectrum)



**Indigo**

Upsilon Omega

+



**Blue-Green**

Mu Upsilon

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## Color Combinations

- Mu-Upsilon
- Upsilon-Omega + Mu-Upsilon
- Omega + Mu-Upsilon

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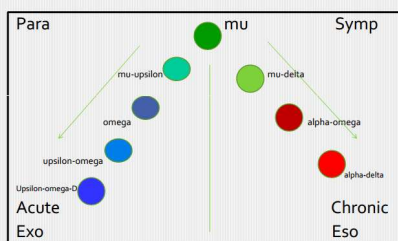
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## Treatment Protocol

- Frequency of light into the eye
- 20 minutes per session
- Minimum of 4x per week
- Progress Evaluation every 8 sessions  
repeat history, vision analysis, VF
- Low Risk and Few Side Effects

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## Hancock Decision Tree



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## Questions?

- See you tomorrow!!

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