



**Photobiomodulation: Mainstream Medicine and Beyond**

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**JOINT CONFERENCE**  
**North American Association for Light Therapy**  
*and*  
**World Association for Laser Therapy**

**September 9–12, 2014 • Arlington, VA**



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**www.naalt.org**

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# NAALT President's Welcome Remarks

Dear Friends and Colleagues,

I wish to extend a cordial welcome to each attendee and thank you for your attendance. Together, we will learn and share as a global community of Photobiomodulation (PBM) enthusiasts. At this joint conference, there is plenty of time to forge new friendships and network with colleagues that can help you move forward with your involvement in Light Therapy. The organizing committee has made a special effort to feature new investigators in the field of Photobiomodulation from across the world. We have also reached out to clinicians in multiple disciplines to share exciting new treatment methods. When you are excited by a particular talk, please introduce yourself to the speaker and share your enthusiasm and own experiences. Exchanging ideas and breakthroughs is how we will continue to move Light Therapy forward into the mainstream of medicine.

I would like to extend a very special thank you to our sponsors and exhibitors. They have put forth significant resources in support of our conference and have a wealth of knowledge and expertise to share with us. Please make time to visit each one, thank them for their support, learn about their products and make purchases that will help you back home in your practices and laboratories. Remember, there is no one light therapy system that can do everything so expand your inventory and grow in your ability to do more in your practice or lab.

I hope you will also enjoy your visit to Virginia and Washington, DC. Tuesday night features a local bluegrass band whose music was crafted out of the mountains of rural Appalachia. On Thursday afternoon a trolley tour of Washington, DC will enable you to visit some of our capital's most famous sites and monuments. That evening, we will gather for our gala dinner where we can sip on local wine, enjoy a delicious meal to the melodies of a string quartet, and hear from one of our most well-known and beloved PBM pioneers, Dr. Tiina Karu. Please don't hesitate to ask me, personally, for other interesting sights and things to do during your visit.

Finally, I would like to thank WALT for the opportunity to host WALT2014 and encourage everyone to continue to support WALT and NAALT by active membership and attendance at our conferences. Remember to stay in touch with your colleagues in PBM and take every opportunity to promote this highly effective modality to your colleagues. Each of us can be a very useful resource for one another in this endeavor.

Thanks y'all!



Richard L Godine, DVM  
President, NAALT  
Co-Chair of Organizing Committee



Richard L. Godine, DVM  
President, NAALT

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# Welcome

## Welcome to WALT2014 in conjunction with NAALT2014

Dear friends and colleagues,

I am very excited by the opportunity to welcome delegates, exhibitors, speakers and sponsors to the combined meetings of WALT2014 and NAALT at the Renaissance Arlington Capital View hotel in Arlington, Virginia. This is the second time in recent years that WALT has partnered with a national laser society to deliver its biennial congress and I think you'll find this collaborative model produces excellent outcomes for all stakeholders. As the joint meeting of WALT and NAALT gets underway, I feel sure that you will see the benefits in leveraging the combined efforts of like-minded associations.

I am aware that the work undertaken by this year's conference organising and scientific committees and support personnel has been incredible, further elevating the standards and potential outcomes for this conference. In particular, I wish to extend my gratitude and heartiest congratulations for a job well-done to Dr Chip Godine, Dr Praveen Arany, Robin Schumacher and Jennifer Anderson. Your dedication and commitment is inspiring.

The Congress scientific program with the theme "*Photobiomodulation: Mainstream Medicine and Beyond*" promises to provide a smorgasbord of information to satisfy everyone's tastes. From a competitive field, almost 90 abstracts were selected for this joint conference, and we thank all authors for their interest in contributing to the expected success of the WALT/NAALT program. The scientific program is structured with the most relevant and contemporary topics in PBM/LLLT including three Hot Topic sessions discussing the latest mechanisms and applications on the near horizon including dosage parameters, and effects on stem cells. A special effort has been made to bring in the best new investigators and clinicians in the field through funding incentives and dedicated sessions. Much thanks needs to be afforded to the panel of international abstract reviewers for their commitment to ensuring a high quality scientific program. We are delighted with the broad range of keynote and invited speakers who will contribute to the high quality we've come to expect of WALT and NAALT conferences. And the continuation of pre-conference workshops will add significant value to your congress dollar – the array of topics in 2014 covers enormous ground.

I am proud to announce that the quality of WALT congresses has been recognised this year by an invitation from Elsevier to index the congress proceedings in Scopus and Compendex (from now on, and back-dated to 2006). The invitation is a clear recognition of the high and ever-increasing scientific quality of WALT congresses as well as the hard work by a succession of WALT committees and supporters over many years. The agreement was co-signed with Medimond International who has been providing WALT its expertise in the publication of its congress proceedings for a number of years. To all presenters, please look out for your invitation to contribute to the full published proceedings, and consider carefully this very significant opportunity to disseminate your research findings.

As delegates, I want to thank you for your on-going support of WALT. I encourage you to make the most of all of the opportunities at WALT2014/NAALT. Please make sure you visit the trade displays and talk to the exhibitors because without them, conferences such as WALT2014/NAALT are difficult to deliver. If you're not a WALT member we trust that you'll find this year's congress interesting and thought-provoking enough that you'll consider joining. We would welcome your application for membership at <http://waltza.co.za/amember/signup>.

As I've said before at major conferences, "to obtain the most from the programming I urge you to talk with someone new each day, catch up with old friends, start new networks, learn as much as you can, see the sites and enjoy the hospitality of locals". And start planning for WALT2016!

In the meantime, I extend to you all a happy and safe time and hope that you enjoy and gain much from the joint WALT2014 and NAALT conference.



A/Prof Liisa Laakso  
Co-Chair  
[l.laakso@griffith.edu.au](mailto:l.laakso@griffith.edu.au)



A/Prof Liisa Laakso  
Co-Chair, WALT

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Jennifer Anderson  
Donna Pattinson

### SCIENCE & EDUCATION COMMITTEE - Thank you to this committee for organizing the 2014 Program:

**Committee Chair** - Praveen Arany  
Heidi Abrahamse, Juanita Anders, Jeffery Basford, G. David Baxter, Rene-Jean Bensadoun, Scott Benjamin, Jan M Bjordal, Robert Bowen, Aldo Brugnera, Christopher Carraway, James Carroll, Roberta Chow, Arun Darbar, Mark Dincher, Janis T. Eells, Reza Fekrazad, Richard Godine, Sandeep Gopalakrishnan, Michael Hamblin, Lars Hode, Tomas Hode, Nicollete Houreld, Ilko Ilev, Peter Jenkins, Douglas Johnson, Raymond Lanzafame, Ernesto Cesar Pinto Leal-Junior, Rodrigo Lopes-Martins, Jeri-Anne Lyons, Kevin Moore, David Rindge, Shimon Rochkind, Shazad Tirmzi, Patricia Trimmer, and Jan Tuner

### SPECIAL COMMITTEE - ABSTRACT REVIEW - Thank you to this committee for reviewing all submitted abstracts for 2014:

Juanita Anders, Praveen Arany, Rene-Jean Bensadoun, Christopher Carraway, James Carroll, Mark Dincher, Richard Godine, Tomas Hode, Nicollete Houreld, Insoo Jang, Peter Jenkins, Douglas Johnson, Raymond Lanzafame, Jeri-Anne Lyons, Gerry Ross, Patricia Trimmer, Jerry True, Jan Tuner,

**Special Thanks to Juanita Anders, Michael Hamblin and Raymond Lanzafame for their scientific consultation and program recommendations.**



# Committees

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### MEMBERSHIP

**Membership Secretary** – René-Jean Bensadoun

### PHOTOMEDICINE & LASER SURGERY JOURNAL

Chukuka Enwemeka – Co Editor *PMLS*

Shimon Rochkind - Co Editor *PMLS*

## *WALT Photomedicine Awards*

Three awards will be presented at the WALT Awards Ceremony on  
Friday, September 12.

A certificate and \$200 prize will be presented to the **Best Poster Presentation, Best Established Scientist Award, and Isaac Kaplan Best Young Scientist Award**



# Schedule



SCHEDULE

## PRE-CONFERENCE WORKSHOPS

### TUESDAY, SEPTEMBER 9

7:30 AM	Registration/Check-In	12:30 PM	<b>LUNCH ON YOUR OWN</b>
8:00 AM	<b>COURSE / WORKSHOP - I</b>	1:00 PM	<b>COURSE / WORKSHOP - III</b>
	Lars Hode <i>Basics of Laser Biophysics</i>		Richard Felten <i>FDA Regulations</i>
	Jeri-Anne Lyons, Nicollete Houreld <i>Basics of Biological Systems</i>		Douglas Johnson, Ernesto Leal-Junior <i>Musculoskeletal Disorder</i>
	Praveen Arany, Michael Weber <i>Basics and Applications of Immunology and Light Therapy</i>		René-Jean Bensadoun, Mark Dincher <i>Oral Mucositis &amp; TMJ Disorders</i>
	David Baxter, Jan Bjordal <i>The Musculoskeletal System</i>		Roberta Chow, Liisa Laakso <i>Pain Disorders</i>
	Juanita Anders, Jeffrey Basford <i>The Neural System</i>		Janis Eells, Patricia Trimmer <i>Light-Biological Interactions</i>
10:30 AM	<b>COURSE / WORKSHOP - II</b>	3:30 PM	<b>COURSE / WORKSHOP - IV</b>
	Gerry Ross, Jerry True, Scott Benjamin <i>Laser Safety</i>		Anita Saltmarche, Shimon Rochkind <i>Neurological Disorders</i>
	James Carroll, Peter Jenkins <i>Best Practices for Reporting Laser Studies</i>		Gerry Ross, Arun Darbar, Reza Fekrazad <i>Dentistry</i>
	Terrance Baker, Chris Carraway <i>Setting Up Laser in Your Practice</i>		Jerry True, Narda Robinson <i>Osteopathy and Chiropractic</i>
	Richard Godine, Narda Robinson <i>Veterinarian Practices</i>		Steve Liu, Shahzad Anwar <i>Acupuncture and Pain/Stress Management</i>
	Sharon Tilley, Ann Liebert, Roberta Chow <i>Lasers in Lymphodema Management</i>		Michael Weber <i>Light Therapy for Allergies</i>
		5:30 PM	END OF PRE-CONFERENCE WORKSHOPS
		6:00 PM	<b>WELCOME RECEPTION &amp; POSTER SESSION I</b>
			Hors D'oeuvres, Cash Bar, and LIVE Entertainment

# Schedule CONTINUED

## WEDNESDAY, SEPTEMBER 10

7:00 AM Registration/Check-In  
Breakfast Buffet

8:00 AM NAALT President's Welcome  
Richard Godine

### 8:15 AM KEYNOTE ADDRESS

Keynote Introduction  
Richard Godine

Krisztina Valter-Kocsi  
*670nm — A Stop Sign for Retinal  
Degenerations?*

9:15 AM INVITED TALK  
Moderator: Roberta Chow

Jeri-Anne Lyons  
*Induction of Regulatory T cells by 670nm  
Light in a Model of Autoimmunity*

10:00 AM EXHIBITS OPEN  
COFFEE BREAK & EXHIBITS

10:30 AM THEMATIC SESSION 1  
*Improving Cognitive and Physical  
Function with Light Therapy*  
Moderator: Steve Liu

Shimon Rochkind  
*Dynamic Changes of Acetylcholine Receptors (AChR) and Creatine Kinase (CK) Activity in Complete Denervated Muscle and Protective Effect of Laser Phototherapy*

Francisco Gonzalez-Lima  
*Stimulation of Cognitive Brain Functions with Transcranial Near-Infrared Lasers and LEDs*

Nicollete Houreld  
*Gene Expression in Wounded and Diabetic Wounded Cell Models in Response to Irradiation at 660 nm*

12:00 PM NAALT ANNUAL GENERAL MEETING & LUNCH  
AGM & Voting 2014 —  
NAALT Members Only

Lunch will be served in the AGM for members, in the Exhibit Area for those not attending the meeting

1:00 PM ABSTRACT TALKS - SESSION 1  
*Young Investigator Competition*  
Moderators: Ernesto Cesar Pinto Leal-Junior & Jeri-Anne Lyons

Violet Bumah  
*The Viability of Blue Light Irradiated Human Cells*

Sturla Haslerud  
*The Efficacy of Low Level Laser Therapy for Shoulder Tendinopathy: A Systematic Review and Meta-Analysis of Randomized Controlled Trials*

Ann Ketz  
*Establishment of an Effective Photobiomodulation Treatment Protocol in an Animal Model of Persistent Neuropathic Pain*

Eduardo Miranda  
*Acute Effect of Phototherapy Combining Super-Pulsed Lasers and LEDs on the Isokinetic Performance (Strength and Endurance) in Patients with Chronic Obstrutive Pulmonary Disease*

Imran Khan  
*ATF-4 Mediates Near-Infrared Laser Phototoxicity*

Ingvill Fjell Naterstad  
*Treating Tendinopathy with Low Level Laser Therapy: A Systematic Review and Meta-Analysis*

3:00 PM COFFEE BREAK & EXHIBITS



**THURSDAY, SEPTEMBER 11**

3:15 PM

**ABSTRACT TALKS - SESSION 2**

Moderator: Lilach Gavish

Timothy Demchak  
*Using Lasers to Treat Fibromyalgia Syndrome: Clinical Case Series*

Charles Philip Gabel  
*A Controlled Case Study Investigation of the Effects of Low Level Laser Therapy in the Treatment of Ruptured Tympanic Membrane*

Insoo Jang  
*Can Phototherapy Ameliorate the Progression of Parkinson's Disease?*

Graham Merry  
*Photobiomodulation in Age-Related Macular Degeneration Using Optical Coherence Tomography*

Paulo de Tarso de Carvalho  
*Effect of Low Level Laser Therapy on the Expression of Inflammatory Mediators and on Neutrophils and Macrophages in Acute Joint Inflammation*

4:30 PM

**THEMATIC SESSION 2**

**LLLT / PBM and Stem Cells**

Moderator: David Baxter

Uri Oron  
*Bone-Marrow Stem Cells and Low-Level Laser Therapy for Ischemia-Reperfusion and Myocardial Infarction*

Heidi Abrahamse  
*Differentiation Potential and Genetic Expression Profile of Adipose Derived Stem Cells in Response to Low Intensity Laser Irradiation*

Praveen Arany  
*Mechanisms of PBM for Therapeutic Application of Dental Stem Cells*

6:00 PM

**EXHIBITS & POSTER SESSION II**

7:00 PM

END OF DAY TWO / EXHIBITS CLOSE

7:30 AM

Registration/Check-In  
Breakfast Buffet

8:00 AM

WALT President's Welcome  
Liisa Laakso

8:15 AM

**KEYNOTE ADDRESS**

Keynote Introduction  
Liisa Laakso

Roberta Chow  
*Beyond Action Potentials — Neuronal Cytoskeletal Signalling as a Mechanism for the Long-Term Effects of Low-Level Laser Therapy*

9:15 AM

**INVITED TALK**

Moderator: Rodrigo Lopes-Martins

Ronald Hirschberg  
*Lab to Clinic to Patient — Why So Slow?*

10:00 AM

**COFFEE BREAK & EXHIBITS**

10:20 AM

**THEMATIC SESSION 3**

**Novel Approaches to LLLT / PBM Mechanisms**

Moderator: Janis Eells

David Baxter  
*Laser Acupuncture for Pain Management: Hype, Hope or Hokum?*

Ann Liebert  
*Neural Cytoskeletal Modulation: A Signal-Transduction Mechanism of Low-Level Laser Therapy (LLLT) in the Nervous System*

Nicole Lohr  
*Endothelial Dependent Stimulation of the Peripheral Circulation by 670 nm Energy*

12:10 PM

**WALT GENERAL MEMBERS MEETING & LUNCH**

WALT Members Only

Lunch will be served in the Members Meeting for members, in the Exhibit Area for those not attending the meeting



# Schedule CONTINUED

SCHEDULE

12:30 PM **EXHIBITS, NETWORKING TIME & EXCURSION**  
Trolley Car Excursion—Meet in Foyer Area  
Tickets available at the registration desk

4:00 PM **EXHIBITS & POSTER SESSION III**

5:00 PM END OF DAY THREE / EXHIBITS CLOSE

7:00 PM **GALA DINNER & AWARDS**  
Tickets for Guests/Spouses are Available

Chukuka Enwemeka  
*Introduction and Brief History of  
NAALT and WALT*

Tiina Karu  
*Photobiomodulation — Where We Are and  
Where We Have to Go*  
Live Entertainment, Wine Tasting

## FRIDAY, SEPTEMBER 12

7:30 AM Registration/Check-In/Breakfast Buffet

8:00 AM **KEYNOTE ADDRESS**

Keynote Introduction  
Randolph Merrick

Jan Bjordal  
*Current Barriers for LLLT/PBM to Become  
Mainstream Clinical Medicine*

9:00 AM **INVITED TALK**  
Moderator: Lars Hode

Ilko Ilev  
*Impact of Critical Laser and Optical Radia-  
tion Characteristics on the Efficacy of Light-  
Tissue Interactions in Novel Therapeutic  
Technologies and Medical Devices*

10:00 AM **COFFEE BREAK & EXHIBITS**

10:30 AM **THEMATIC SESSION 4**  
*Low Dose Effects in Biology*  
Moderators: Patricia Trimmer & Chukuka  
Enwemeka

Edward Calabrese  
*HORMESIS: Adaptive Responses in Biology  
and Medicine*

Antone Brooks  
*The Impact of Research on Low Doses of  
Ionizing Radiation on Cancer Risk Estimates*

Mark Mattson  
*An Emerging Armamentarium to Forestall  
Neurodegenerative Disorders*

12:00 PM **LUNCH ON YOUR OWN**

1:00 PM **ABSTRACT TALKS - SESSION 3**  
Moderator: Violet Bumah

James D. Carroll  
*The Roadmap for LLLT to Become a  
Mainstream Medical Procedure*

Alexandra Schnee  
*A Three Year Analysis of the Effects of Low-  
Level Laser Therapy on Patients Suffering  
with Bone on Bone Osteoarthritis Knee  
Pain: A Detailed Analysis by Questionnaire*

Arun Maiya  
*Effect of Low Level Laser Therapy in the Man-  
agement of Diabetic Peripheral Neuropathy*

Aya Hoshikawa Hirai  
*Laser Therapy Modulates the Systemic  
Inflammatory Process in an Experimental  
Model of Sepsis in Rats*

3:00 PM **COFFEE BREAK & EXHIBITS**

3:20 PM **PANEL DISCUSSION**  
*PBM / LLLT DOSE: Are We There Yet?*  
Moderator: Juanita Anders

Panelists: Richard Godine, James Carroll,  
Luis De Taboada, Janis Eells, Jan Bjordal,  
Rodrigo Lopes-Martins, Roberta Chow,  
Gerry Ross, Clark Tedford

3:30 PM EXHIBITS CLOSE

4:30 PM **WALT AWARDS CEREMONY**

4:45 PM Concluding Remarks  
Praveen Arany  
NAALT President 2014-2016

5:00 PM End of Conference



# Workshop Descriptions

## PRE-CONFERENCE WORKSHOPS TUESDAY, SEPTEMBER 9, 2014

8:00AM

### **BASICS OF LASER BIOPHYSICS**

**Lars Hode, PhD**

Dr. Lars Hode is a Physicist and chairman of the Swedish Laser-Medical Society. The idea with this seminar is to make the physics behind Laser Photo Therapy understandable. We will make some practical experiments illustrating: Different forms of light/radiation; Waves, wavelength and frequency; Spectrum and band width; Polarization; Coherency – interference – speckles; Divergence – convergence – parallelism; Different forms of pulsing; Power, power density; Energy, energy density; Light penetration into living tissue; Transmission through clothes and fur; Dose – what is dose?

### **BASICS OF BIOLOGICAL SYSTEMS**

**Nicolette N. Houreld, PhD**

**Jeri-Anne Lyons, PhD**

#### *Mechanisms and Molecular Basis of Photobiostimulation*

The application of visible red/near infrared (VR/NIR) light administered via lasers or light-emitting diodes (LED), termed photobiomodulation or Low Level Light Therapy (LLLT), has profound effects on energy metabolism and inflammation in compromised biological systems. Together, mitochondria and the immune response are responsible for the damaging inflammatory responses characteristic of the pathology of a vast array of disorders which are improved by LLLT. Current evidence suggests that cytochrome c oxidase (complex IV), the terminal enzyme in the electron transport chain (ETC), is a light absorbing chromophore for VR/NIR light. When cytochrome c oxidase absorbs photon energy, the redox state of the mitochondria is changed and there is an increase in mitochondrial membrane potential (MMP), adenosine triphosphate (ATP) production, cyclic AMP (cAMP), intracellular calcium ( $[Ca^{2+}]_i$ ), nitric oxide (NO), and reactive oxygen species (ROS). This in turn leads to stimulation of cellular process and down-stream effects, including down-regulation of nitro-oxidative stress and pro-inflammatory

cytokines and up-regulation of anti-oxidant mechanisms and anti-inflammatory cytokines. This workshop will provide an overview of mitochondrial function and the immune response. The effect of photobiomodulation on energy metabolism and the generation of ATP will be discussed. The importance of the balance of pro-inflammatory and anti-inflammatory responses necessary to protect the body against infection, and the need to control these mechanisms to prevent chronic inflammation that leads to pathology will be explained. Participants will gain an appreciation for: 1) the effect of photobiomodulation on mitochondrial function and energy metabolism; 2) the need for inflammatory responses in combating infections and the role of NO in regulating the immune response; 3) an understanding of the mechanisms associated with pathology when inflammation and nitro-oxidative stress runs awry; and 4) the role of photobiomodulation in down-regulating these pathologic responses.

### **BASICS AND APPLICATION OF IMMUNOLOGY AND LIGHT THERAPY**

**Praveen R Arany DDS, PhD**

**Michael Weber, MD**

#### *Basics of Immunology: Implications for Light Therapy*

The human immune system is a major pathophysiological surveillance system. Using a range of components ranging from molecules to cells, the body is able to resist and repair a large number of insults and injuries from wounds, infection to malignancies. This course will provide basic details of the classical immune system outlining the cellular and humoral arms. Emphasis will be placed on the role of local or regional immune responses as compared to more global, systemic immune responses the system can initiate. Finally, the presenters will attempt to integrate our current understanding of light biological system responses and its implications for various therapeutic applications such as immunomodulation for autoimmune diseases, cancer vaccines, among others.

### **THE MUSCULOSKELETAL SYSTEM**

**G. David Baxter, TD BSc(Hons) DPhil MBA**

**Jan M Bjordal, PT, PhD**

The aim of this workshop is to provide attendees an evidence-



# Workshop Descriptions

CONTINUED

based background to the treatment of musculoskeletal disorders for laser photobiomodulation. The workshop will include three main components: (i) *The musculoskeletal system in health and disease* - overview of the structure and function of the musculoskeletal system including muscle, nerve, and bone; pathogenesis and aetiology of common musculoskeletal conditions; musculoskeletal pain and its management through non-pharmacological treatments. (ii) *Treatment of Musculoskeletal Disorders* - overview of application of laser therapy in the treatment of musculoskeletal conditions, based upon biophysical principles; relevance of treatment parameters, and scientific rationale for selection. (iii) *Treatment of selected Musculoskeletal Conditions: Application and Current Evidence*. This will include demonstration of treatment techniques, and review of the current evidence of clinical effectiveness. Conditions covered in the workshop will principally include tendinopathies, osteoarthritis, neck and back pain, and neuropathic pain.

## THE NEURAL SYSTEM

**Juanita Anders, PhD**  
**Jeffrey R. Basford, MD, PhD**

This workshop will provide an overview of the physiological effects of the interaction of light with the nervous system. We will begin with the basic anatomy of its central and peripheral components and then proceed to review our current understanding of the structural and functional deficits of specific injuries and pathologies. The important question of why light has beneficial effects on this system's injuries and diseases will be examined from two aspects. One, addressing how light alters the secondary injury cascades in the central nervous system and, consequently, results in neuronal protection/sparing and supports peripheral nervous system nerve regeneration. The second will emphasize the roles of intracellular processes, mitochondrial function, and inflammation. The anatomical and physiological appropriateness of light-based treatment of the variously located and structured components of the nervous systems will also be briefly examined. The workshop will conclude with a brief summary of the current experimental and clinical evidence base for the light-based treatment of nervous system injuries and diseases.

10:30AM

## LASER SAFETY

**Jerry True, DC, FIACN**  
**Gerald Ross, DDS**  
**Scott Benjamin, DDS**

### *Laser Safety in the Practice of Laser Therapy*

This course is designed so that participants will have the necessary knowledge to become a laser safety officer in LLLT. The ANSI standards will be presented for both Class 3 and Class 4 lasers, eye protection, Hazard zones, and signage will be covered. Dr Scott Benjamin, who sits on the committee that created the latest ANSI upgrade and gives the Laser Safety course for the Academy of Laser Dentistry, will act as a resource in the presentation.

*Please note:* this course is for information only; IT IS NOT A CERTIFICATION COURSE.

## BEST PRACTICES FOR REPORTING LASER STUDIES

**Peter A. Jenkins, MBA**  
**James D. Carroll**

### *Reporting Dose and Beam Parameters for LLLT Studies*

Dose and irradiation parameters are critical for successful LLLT treatments, however, researchers frequently make critical errors and omissions when submitting papers for publication. Journals frequently publish studies with missing data, mathematical errors, and no verification of beam parameters. This makes reproducibility impossible, and further confounds an already complex subject. This article is intended to be a reference document for non-physicist researchers conducting low-level laser therapy (LLLT) laboratory studies and clinical trials to help them design and report Dose and irradiation parameters.

We show the eight most important beam parameters to report, which are: wavelength, power, beam area at the skin or culture surface (this is not necessarily the same as the aperture size), pulse parameters, anatomical location, number of treatments, and interval between treatments. The three commonly used dose parameters are time, energy, and energy density. More comprehensive reporting would include coherence, application

PRE-CONFERENCE



technique (contact, projection, scanning, pressure), beam profile, and spectral width, as these may also be important. Beam power often decreases as the device warms up and as the device ages; therefore, this should be checked routinely during an experiment/trial.

## **SETTING UP LASERS IN YOUR PRACTICE**

**Terrance L. Baker, MD, MS**

**Christopher Carraway, DC, DIBCN, CLS**

*Building a Clinical Practice: Shining the spotlight on LLLT*

This course will provide an intensive introductory workshop that is designed to show prospective novice, as well as established clinicians exactly how to start and build a successful medical therapeutic laser practice. This course is specifically designed for prospective and novice medical practitioners and requires no advance knowledge or training. Attendees will learn from experienced faculty in a step-by-step fashion how to start and build a successful medical therapeutic laser practice.

Low Level Lasers are an exciting modality, however it can be confusing for novice users. The second part of the course is designed to address the most common questions posed by clinicians as they incorporate laser therapy into their practice. It goes beyond the “didactic” by including practical information on device selection, safety, and reimbursement all necessary for establishing a successful laser practice. Particular attention will be made to clinic readiness, how to market and talk to patients and include an open discussion on legal considerations and concerns. The panel will share many clinical success stories and pearls on how the addition of laser therapy has impacted their clinical practices. The session will conclude with an open group discussion on the pitfalls and benefits of building successful laser practices in the clinical arena.

## **LASERS IN VETERINARY PRACTICE**

**Narda G. Robinson, DO, DVM, MS, FAAMA**

**Richard Godine, DVM**

This workshop will address two common questions among veterinarians new to laser therapy: 1) “Which unit should I buy?” and 2) “How do I treat this condition?” Considering the diversity of species veterinarians encounter, it behooves

animal healthcare professionals to understand the various features and construction of phototherapy units so that they can most suitably select the laser(s) and LED unit(s) that best fit their practice needs. Our intention is not to recommend one unit over another but rather to equip the attendee with the knowledge to evaluate units within their budget and make sound decisions for their individual objectives. Much of this information will be relayed in the context of how we design protocols for common applications in veterinary medicine, including case discussions involving the musculoskeletal, integumentary, neurologic, renal, and digestive systems.

In this discussion, Dr. Robinson presents the myriad application of laser therapy and LED treatment for wild and exotic animals. The case-based discussion will consider the unique features of veterinary photomedicine as applied to species outside of the typical veterinary spectrum, spanning from large felidae to aquatic and avian patients. For this unique patient population, photomedicine offers anecdotal benefits such as relief of pain from acute and chronic disease and hastened recovery from neurologic injury. That said, issues of limited patient access, concerns about safety for patient and practitioner, and dosing confusion persist.

## **LASERS IN LYMPHOEDEMA MANAGEMENT**

**Sharon Tilley, PhD, PT**

**Ann Liebert, PhD, PT**

**Roberta Chow, MB, BS, FRACGP, PhD**

Low Level Laser has been successfully employed to manage a range of oedemas in a clinical setting since the late 1980’s in Australia. One of the most common forms is secondary lymphoedema, a high protein form of oedema which primarily occurs as the result of trauma to the lymphatics from surgery and radiotherapy and which can cause significant pain, morbidity and reduced quality of life in patients. Post-mastectomy lymphoedema has been the subject of extensive research at Flinders University, South Australia. This has culminated in the development of the first FDA approved laser device for this condition. Other forms of oedema are low-protein which can occur following surgery, injury or with inflammation and also add to pain and reduced mobility. The use of Low Level Laser to treat these oedemas is an important clinical development in improving treatment outcomes.

# Workshop Descriptions

CONTINUED

This workshop will present a brief overview of the anatomy of the lymphatic system and the micro and macroscopic effects on this system as a result of photobiomodulation. Evidence based protocols and the supporting research will underpin a discussion on the clinical use of laser for conditions such as pre and post surgical oedema, secondary lymphoedema, lipoedema and venous oedema. Topics such as dosage, method of application and treatment frequency will be covered.

1:00PM

## FDA REGULATIONS

Richard P. Felten

*FDA Regulation of Low Level Light Based Medical Devices*

The Center for Devices and Radiological Health (CDRH) in the Food & Drug Administration (FDA) is responsible for the regulation of light based medical devices. This workshop will discuss the review processes involved in granting marketing permission for low level light based medical devices, both laser and non-laser systems. The presentations will describe the organizational structure of CDRH with emphasis on those organizations within CDRH that have specific roles in the regulation of lasers as well as those organizations that maybe involved in the regulation of low level light based systems for medical indications for use. The various regulatory routes that a specific light based device may need to follow to obtain marketing permission will be discussed with specific examples of device types that have previously been reviewed by these processes. The basis for requiring only technological comparisons versus the need for bench testing or clinical data will be discussed and again examples of how this process has been used will be included.

## MUSKULOSKELETAL DISORDERS

Douglas Johnson, ATC, EES, CLS

Ernesto Cesar Pinto Leal-Junior, PhD, PT

*Beyond Science: Translating Research into best clinical practice for Musculoskeletal Condition.*

This pre-conference explores the many challenges present in the use and adoption of photobiomodulation in musculoskeletal

conditions in everyday clinical practice. A review of the current evidence based research on PBM in physical medicine and rehabilitation will be presented and used to spur an open discussion on their potential impact on the clinician and current practice standards. The focus will be on conditions and diseases seen in everyday clinical practice and how research can support better clinical outcomes. We will discuss the challenges that clinicians face when adopting research into best clinical practices and how to minimize the compounding and mitigating factors associated with patient care can impact the outcomes. A Research-Clinician Team approach concept will be presented in for developing future translational research that is both scientifically sound but clinically significant.

The goal of this conference is to bring a level of understanding between researchers and clinicians to create a collaborative learning environment for future learning. It will share unique perspectives from both researcher and clinicians on the issues of adoption and advancement of PBM. This course will use both diabetic and open group discussion to meet its learning objectives.

## ORAL MUCOSITIS AND TMJ DISORDERS

René-Jean Bensadoun, MD

Mark Dincher, DMD, MS

Oral mucositis is a common sequelae of many forms of oncotherapy especially chemo and radiation therapy. While this is a self-resolving disease, it causes significant patient discomfort and often interferes with critical oncotherapy regimens that can be lethal. Trismus due to Temporomandibular joints (TMJ) pathology is a difficult clinical scenario often encountered in dental clinics routinely. While both conditions are managed currently with empirical approaches, light therapy has shown promise in effective clinical management. This workshop will focus on rationale, evidence-based medicine, and clinically-validated protocols regarding the use of LLLT and LEDs in the prevention and treatment of cancer-treatment related Mucositis and Trismus (TMJ Disorders). At the end of this workshop, attendees should be able to utilize LLLT for these indications with adequate information on protocols and laser parameters.



## **PAIN DISORDERS**

**Roberta Chow, MB, BS, FACGP, PhD**  
**Associate Professor Liisa Laakso**

Dr. Roberta Chow is well known internationally for her work describing how laser irradiation induces analgesic effects by varicosity formation, reducing mitochondrial potential and blocking fast axonal flow in dorsal root ganglion in rats. Dr Chow's 2009 Lancet paper (with colleagues) is one of the most significant publications in laser therapy literature.

Dr. Laakso is the current President of the World Association for Laser Therapy. Dr. Laakso's research has focused on understanding the autonomic nervous system response to laser therapy for the management of chronic pain. Her research has also included investigations of laser therapy on malignant cells as well as in muscle exercise responses.

Both presenters hold executive positions with the Australian Medical Laser Association, they have published together and collaborated in the delivery of a number of laser therapy workshops over many years.

In this preconference course, the presenters will individually summarize their research and the clinical application of their findings. Both presenters will then demonstrate the practical application of laser therapy and their philosophy underpinning pain management in a clinical setting. There will be some time during the course to compare and contrast the methods used by the presenters, and for interaction with delegates.

## **LIGHT-BIOLOGICAL INTERACTIONS**

**Patricia A. Trimmer, PhD**  
**Janis T. Eells, PhD**

### *Light-Biological Interactions that Benefit Neurodegenerative Disease*

Mitochondrial dysfunction, inflammation and metabolic insufficiency are recognized features of neurodegenerative diseases like Alzheimer's disease, Parkinson's disease and amyotrophic lateral sclerosis. Light interactions with photo acceptor molecules have been shown to alter important processes involved in the pathogenesis of neurodegenerative disease. There will be a review of specific ways that photobiomodulation can be applied to neurodegenerative disease for therapy development.

At the Light-Biological Interactions Pre-Conference, we will also brainstorm what approaches are needed to focus the development on light therapy for the treatment of neurodegenerative disease.

Tissue irradiation with light in the far-red to near-infrared region of the spectrum has been shown to induce a wide variety of biological effects ranging from immune modulation and wound healing to stem cell proliferation and neural repair. The photoacceptor molecules and intracellular signaling pathways responsible for these actions are incompletely understood. This workshop will review the current status of our understanding of the intracellular mechanism(s) of photobiomodulation and then focus specifically on the light-biological interactions in the treatment of retinal degeneration and neurodegenerative disease.

**3:30PM**

## **NEUROLOGICAL DISORDERS**

**Anita Saltmarche RN, BScN, MHSc**  
**Shimon Rochkind, MD, PhD**

Posttraumatic nerve repair and prevention of muscle atrophy represent a major challenge of restorative medicine. Considerable interest exists in the potential therapeutic value of laser phototherapy for preventing denervated muscle atrophy as well as enhancing regeneration of severely injured peripheral nerve. *In denervated muscle*, animal study suggests that function of denervated muscles can be partially preserved by laser treatment, initiated at the earliest possible stage post-injury. *In peripheral nerve injury*, laser phototherapy maintains functional activity of the injured nerve, decreases scar tissue formation at the injury site, decreases degeneration in corresponding motor neurons of the spinal cord and significantly increases axonal growth and myelination. *In cell cultures*, laser irradiation accelerates migration, nerve cell growth and fiber sprouting. *In a pilot, clinical, double-blind, placebo- controlled randomized study* in patients with incomplete long-term peripheral nerve injury, 780-nm laser irradiation can progressively improve peripheral nerve function, which leads to significant functional recovery. *Conclusions:* Laser phototherapy temporarily preserves the function of a denervated muscle, accelerates and enhances axonal growth and regeneration after peripheral nerve injury or reconstructive procedures. Laser activation of nerve cells, their growth and axonal sprouting can be a potential

# Workshop Descriptions

CONTINUED

treatment of neuronal injury. Animal and clinical studies showing the promoting action of phototherapy on peripheral nerve regeneration, making it possible to suggest that time for broader clinical trials has come. Dr. Shimon Rochkind is the Director, Division of Peripheral Nerve Reconstruction, Department of Neurosurgery, Tel Aviv Sourasky Medical Center, Tel Aviv University, Israel.

An estimated 5.3 million Americans are living with TBI-related disabilities, with approximately 1.7 million more annually. Transcranial red/near-infrared (NIR) LED therapy has been observed to improve cognitive function in mTBI (Naeser, Zafonte, Krengel et al., 2014). Mechanisms underlying improvement will be reviewed in this portion of the workshop that summarizes a study investigating transcranial LED therapy to improve cognition in chronic, mTBI (J. Neurotrauma, June 2014). Eleven chronic, mTBI participants (26-62 Yr, 6M) were treated for 18 sessions over 6 weeks. LED cluster head using visible red and infrared energy in continuous mode were applied to 12 scalp placements (13 J/cm<sup>2</sup>). Significant improvements were observed in executive function (inhibition and inhibition/switching, Stroop), verbal memory (long delay free recall, CVLT), and fewer post-traumatic stress disorder (PTSD) symptoms, and less depression after 6 weeks of LED therapy. Improved sleep, better ability to perform social, interpersonal, and occupational functions were also reported. Additionally, the translation of this LED treatment protocol into home treatments in mTBI case studies will be presented.

## DENTISTRY

**Gerry Ross, DDS**

**Arun Darbar, DDS**

**Reza Fekrazad, DDS**

This presentation is for anyone who is using or wishes to use Photobiomodulation-LLLT in a clinical dental practice. There will be an introduction to the mechanism of action, primary and secondary effects and biphasic dose response. Reza Fekrazad (periodontist) will present on LLLT in periodontics and photodynamic therapy (PDT) in dentistry. Arun Darbar will present LLLT in orthodontics and pre-conditioning. Gerry Ross will present LLLT use in a general dental practice. These will each be half hour presentations and there will be a questions period at the end.

## OSTEOPATHY AND CHIROPRACTIC

**Jerome True, DC, FIACN**

**Narda G. Robinson, DO, DVM, MS, FAAMA**

*Laser Therapy: Case Studies in Musculoskeletal Medicine*

The osteopathic and chiropractic professions have overlapping paradigms for treatment of musculoskeletal injuries. Laser therapy is a valuable modality asset as an adjunctive for the treatment of musculoskeletal pain disorders. Narda G. Robinson, DO, DVM, MS, FAAMA and Jerry True, DC, FIACN, highly regarded in their respective professions as experts in laser therapy, will cover patient selection and basic treatment protocols from the osteopathic and chiropractic perspective, respectively. Case studies from each lecturer and treatment outcomes will be discussed. Dr. Robinson also teaches laser therapy in veterinary medicine. Dr. True is a chiropractic neurologist who has lectured and trained chiropractic physicians in laser therapy and laser safety for many state continuing education venues.

## ACUPUNCTURE AND PAIN/STRESS MANAGEMENT

**Shahzad Anwar, MD**

**Steve Liu, LAc, BSEE**

*Laser Acupuncture For Anxiety, Depression & Stress Management*

This 2-hour workshop will provide a comprehensive review and update of the basic science and advances in the field of laser acupuncture for pain and stress management. Upon completion of this activity, participants will be able to: Learn brief history of laser acupuncture and current clinical applications; determine which patient will benefit from laser acupuncture treatment and optimally select patients for non-pharmacologic treatment of acute/chronic pain and stress with laser acupuncture appropriately; Incorporate a variety of pain relieving and healing techniques into practice to assure adequate pain control and full recovery for your patients; Consider mind-body techniques to use in practice to help your patients with chronic or debilitating pain; Apply current guidelines for the management of chronic pain and stress. This workshop is suitable for acupuncturists, family physicians, physiotherapists, pain specialists, neurologists, anesthesiologists, dentists, pharmacists, internists, psychologists, psychiatrists, nurses,



social workers and physician assistants with an interest in the treatment of pain and stress. The target audience is meant for a combination of regional, national and international participants.

## **LIGHT THERAPY FOR ALLERGIES**

**Michael Weber, MD**

Allergic diseases are a hypersensitivity disorder of the immune system. Symptoms include red eyes, itchiness, and runny nose, eczema or asthma. The conventional medical causal therapy is hypo sensitization (specific immunotherapy), which involves the regular application of the allergen to the skin or under the tongue over a period of usually three years. - The method of laser desensitization can be used for all allergic diseases. It consists of two elements: 1) laser hypo sensitization and 2) proven allergy frequencies. In many cases the allergic hypersensitivity can be completely eliminated and medication (anti allergic drugs, corticosteroids) discontinued. In food allergies such as apple, carrots, cherries our results prove more than 90% success. Life-threatening anaphylactic conditions can be avoided in many cases. LLLT in allergic conditions, especially in food allergies is a highly successful therapeutic approach. In contradiction to the standard western medical approach, it is a pain free method without any severe side effects.

# Poster Session Summaries

## POSTER SESSION I

**TUESDAY, SEPTEMBER 9, 6:00PM – 8:00PM**

- Robabeh Alijanpour *The Effect of Topical Finasteride 0.5% on the Results of Diode Laser in the Treatment of Facial Unwanted Hairs*
- Thais Almeida *Low-Level Laser Therapy Prevents Quadriceps Muscle Atrophy in a Model of Knee Osteoarthritis*
- Shahzad Anwar *Comparison of Clinical Effectiveness of Laser Acupuncture and Amitrytline in Diabetic Peripheral Neuropathy (DPN): A Sham Controlled Randomized Clinical Trial*
- Shahzad Anwar *Laser Acupuncture for Autism Spectrum Disorder: A Randomized Sham Controlled Trial*
- Livia Assis *Low-Level Laser Therapy Modulates Inflammatory Response and Degenerative Process in a Model of Knee Osteoarthritis*
- Sturla Haslerud *The Efficacy of Low Level Laser Therapy for Shoulder Tendinopathy: A Systematic Review and Meta-Analysis of Randomized Controlled Trials*
- Jon Joensen *LLLT for Carpal Tunnel Syndrome, Without Vs With Glucocorticoid Treatment - A Case Study*
- Jon Joensen *The Skin Barrier in Irradiation from Infrared LLLT Devices*
- Graham Merry *Photobiomodulation in Age-Related Macular Degeneration Using Optical Coherence Tomography*
- Luiz Paulo Milares *The Effects of a Resistance Training Protocol and Low-Level Laser Therapy on Muscle Tissue in Diabetic Rats*
- Ana Claudia Muniz Renno *The Effects of Low Level Laser Irradiation on Bone Tissue in Diabetic Rats*
- Carlos E Pinfieldi *Mast Cell Curve-Response in Partial Achilles' Tendon Rupture after 830nm Phototherapy*
- Iraj Yazdanfar *Effects of Diode Laser on Direct Pulp Capping Treatment-A Pilot Study*



**POSTER SESSION II**  
**WEDNESDAY, SEPTEMBER 10, 6:00PM – 8:00PM**

Maria Bewczyk	<i>Low-Level Laser Therapy (LLLT) Versus Platelet-Rich Plasma Injections (PRP; Syn Autologous Blood Injection) in Tendinopathy, Enthesopathy and Ligamentous Injury: A Systematic Review and Comparison of Evidence, Mechanisms and Adverse Effects.</i>
Caroline Bublitz	<i>Acute Effects of Low-Level Laser Therapy on the Functional Capacity of Hospitalized Heart Failure Patients</i>
Rogério Castilho	<i>Laser Therapy Induces Physiological Accumulation of ROS Without DNA Damage</i>
Roberta Chow	<i>Neural Cytoskeletal Modulation: A Signal-Transduction Mechanism of Low-Level Laser Therapy (LLLT) in the Nervous System.</i>
Roberta Chow	<i>650nm Laser Irradiation (LI) of Rat Dorsal Root Ganglion (DRG) Neurons Causes Significant, Reversible Changes in Neuronal Organization.</i>
Marina Curra	<i>Effect of Laser Phototherapy (LPT) in Nf-Kb Levels of 5-Fluorouracil-Induced Bucal Mucositis in Hamster</i>
Aya Hoshikawa Hirai	<i>Laser Therapy Modulates the Systemic Inflammatory Process in an Experimental Model of Sepsis in Rats</i>
Ann Ketz	<i>Establishment of an Effective Photobiomodulation Treatment Protocol in an Animal Model of Persistent Neuropathic Pain</i>
Volkmar Kreisel	<i>Low Level Laser Therapy for Age-Related Macular Degeneration AMD</i>
Ann Liebert	<i>Mechanotransduction as a Mediator of Laser Treatment Effects in Tendon and Muscle Repair</i>
Lew Lim	<i>Intranasal Photobiomodulation Improves Cognitive and Memory Performance of Alzheimer's Disease Patients in Case Studies</i>
Wonbong Lim	<i>Inhibition of Anti-Cancer Drug Resistance by 635nm LED Irradiation Via Modulation of Cancer Stem Cell Property</i>
Rodrigo Lopes-Martins	<i>Low Level Laser Therapy in Experimental Model of Strain-Induced Skeletal Muscle Injury in Rats: Effects on Inflammatory Cytokines and Muscle Histology</i>
Angela Magri	<i>Low Level Laser Therapy and Bone Healing in Diabetic Rats: A Biological Evaluation Using an Experimental Model of Tibial Bone Defect in Rats</i>
Manoela Domingues Martins	<i>Efficacy of Laser Phototherapy in Comparison to Topical Clobetasol for the Treatment of Oral Lichen Planus: A Randomized Controlled Trial</i>
Carla Christina Medalha	<i>Effects of Low Level Laser Therapy on Bone Repair After Spinal Cord Injury</i>
Ana Claudia Muniz Renno	<i>Acute Effects of Low-Level Laser Therapy on the Functional Capacity of Hospitalized Heart Failure Patients</i>
Ingvill Fjell Naterstad	<i>Treating Tendinopathy with Low Level Laser Therapy</i>
Natalia Rodrigues	<i>Low-Level Laser Therapy (LLLT) Attenuates Muscle Damage in Delayed Onset Muscle Soreness (DOMS)</i>
Lia Mara Rodrigues	<i>Laser Therapy of Low Frequency Can Modulate Insulin Release in Healthy Animals?</i>
José Carlos Tatmatsu Rocha	<i>Biomodulation of Oxidative Stress in Diabetic Mice Skin Using Laser-Low Power</i>
Patrícia Gabrielli Vassão	<i>Effects of 808nm Low-Level Laser Therapy Associated with Strength Training in Elderly Women</i>
Suellen Veronez	<i>Effects of Low Level Laser Therapy in Sensory and Motor Aspects After Spinal Cord Injury</i>
Weixing Yan	<i>Clinical Application of Non Invasive Laser Blood Irradiation</i>
Weixing Yan	<i>Integrative Laser Therapy for Managing Fibromyalgia</i>

# Poster Session Summaries

CONTINUED

## POSTER SESSION III

THURSDAY, SEPTEMBER 11, 4:00PM – 6:00PM

- Heidi Abrahamse *Effects of Sulfonated Zinc Phthalocyanine and Low Intensity Laser Irradiation in Inducing Photodynamic Damage in Breast Cancer Cells*
- Sandra Ayuk *Low Intensity Laser Irradiation at 830nm Alters Gene Expression Pattern and Cellular Responses in Diabetic Wound Healing Invitro*
- Violet Bumah *The Viability of Blue Light Irradiated Human Cells*
- Paulo de Tarso C de Carvalho *Effect of Low Level Laser Therapy on the Expression of Inflammatory Mediators and on Neutrophils and Macrophages in Acute Joint Inflammation*
- Timothy Demchak *Home LLLT Successfully Treated Wartenberg's Migratory Neuropathy*
- Insoo Jang *Laser Therapy on the Gait Ability of Parkinson's Disease: A Double-Blind Randomized Controlled Trial*
- Katayoun A.M. Kalhori *The Effect of Red, Green and Blue Lasers on Healing of Oral Wounds in Diabetic Rats*
- Imran Khan *ATF-4 Mediates Near-Infrared Laser Phototoxicity*
- Kyung Goo Lee *Non Surgical Use of Co2 Laser: A Literature Review.*
- Dong-Jin Lim *Evaluation of Wound Healing Membranes with Different Porosity for Laser and LED Phototherapies*
- Marcia Marques *Dental Pulp Stem Cells Conveyed in BMP-4 Loaded Hydrogels Response to Laser Phototherapy*
- Eduardo Foschini Miranda *Acute Effect of Phototherapy Combining Super-Pulsed Lasers and LEDs on the Isokinetic Performance (Strength and Muscular Endurance) in Patients with Chronic Obstructive Pulmonary Disease*
- Srinivasa Murthy *The Effect of Low-Level Laser Therapy on Chronic Knee Osteoarthritis: A Clinical Study & Report*
- Srinivasa Murthy *The Effect of Low-Level Laser Therapy on Chronic Cervical Spondylosis: A Clinical Study & Report*
- Anita Saltmarche *Adjunctive Use of Combination of Super-Pulsed Laser and Light-Emitting Diodes Phototherapy on Non-Specific Knee Pain: Double-Blinded Randomized Placebo-Controlled Trail*
- Paula Santos *Evaluation of the Effectiveness of Low Power Laser and Short Waves in the Treatment of Knee Osteoarthritis*
- Arista Shojaeddin *Comparing the Effects of Behavioral Therapy in Combination with Laser Acupuncture in Autism Spectrum Disorders: A Randomized Controlled Trial.*
- Elieza Tang *In Vivo Wound Healing with Light Therapy*



## NAALT Photomedicine Awards

The major purpose of these awards is to foster collaboration and encourage active participation from all members highlighting the unique interdisciplinary forum that NAALT offers the photomedicine community. We hope this will extend the science and education mission of NAALT, which is “to promote phototherapy as a valid treatment, and to improve understanding of photobiological mechanisms, basic laser physics, safety, treatment parameters, techniques, regulatory issues and reimbursement.”

The awards have been named after pioneers in photobiomodulation or photomedicine sciences who have made seminal contributions to the therapeutic light community through their research, clinical and educational accomplishments.

The **Chukuka Enwemeka Lifetime Excellence in Photomedicine Award** for a mid/senior level clinician-scientist is meant to recognize significant contributions of an individual to the field of photomedicine. The two young investigator awards, **Tiina Karu Basic Photomedicine** and **Mary Dyson Clinical Photomedicine**, are primarily meant to motivate our coming generation of scientists and clinicians to explore and forge ahead in our understanding of photomedicine. The Young Investigator competition will be held on Wednesday, September 10.

The NAALT Travel Awards were awarded to ten recipients chosen based on the scientific merit of their submitted abstracts judged by three expert reviewers, representation of the global membership, student status and practical cost of attendance. Recipients must attend and present their work in person at the meeting, and will be presented with a certificate and check for \$500.

Details on award eligibility and selection are available on our website (<http://www.naalt.org/awards>).

Awards will be presented to the recipients at the Gala Dinner & Awards Presentation on Thursday, September 11.

### **Ron Ignatius Memorial Award (1939 - 2011)**

We truly lost a brilliant mind with the passing of Ron Ignatius. Throughout his life, Ignatius was very passionate about science and technology. He didn't just want to know what something was, he needed to know how it worked and how it could be used to better life. It was with this drive that he founded Quantum Devices, Inc. in 1989, where he used his knowledge and dedication towards the principle of Improving the Quality of Life through the Power in Light. Ignatius invented the plant growth LED lighting systems for NASA, setting the stage for NASA LEDs in medical applications and earning the prestigious NASA Space Technology Hall of Fame Award in 2000. Mr. Ignatius spent his entire life focused on light. He used NASA SBIR dollars along with his own personal funds to promote over \$2M in research, having over 18 years devoted to the science of light. NAALT is pleased to have the Ron Ignatius Memorial Award Fund to celebrate research, education and implementing the use of therapeutic light.

<http://www.naalt.org/awards.htm>

# Biographies

## KEYNOTE SPEAKERS

### Jan M Bjordal, PT, PhD

*Professor Bergen University  
College & University of  
Bergen, Norway*



**Dr. Jan M. Bjordal** is trained as a physical therapist, with a PhD from University of Bergen, Norway in 2003. His current affiliations are Professor at University of Bergen and Bergen University College, and visiting professor at Leeds Metropolitan University, UK. His main area of research is to identify mechanisms and optimal doses for LLLT in musculoskeletal pain management.

He has authored 81 scientific publications, some of them in high-ranked journals like *The Lancet*, *British Medical Journal* and *Annals of Internal Medicine*, and his publications are cited more than 3800 times by other researchers. Prof. Bjordal has made 40 international congress presentations, several of them as keynote or invited speaker. He is the author of the textbook *Clinical Electrotherapy* and has authored several chapters in pain management and laser phototherapy textbooks. He is on the editorial board of three scientific journals, and he has been acting as referee for more than thirty Medline-listed journals.

Through his work with low level laser therapy (LLLT) he was acting advisor for the Norwegian Physical Therapy Association when LLLT approval was given by the Ministry of Health in Norway in 2001, and he led the expert group in the Norwegian Health Technology Assessment which concluded that low level laser therapy was effective in knee osteoarthritis in 2004. In 2008, he was awarded both the Muscle & Skeletal prize by the Norwegian Manual Therapist Association, and the Neck & Back Pain prize at the first multidisciplinary Norwegian Neck & Back Pain congress. His critical comments on recommendations of medication in the 2007 US guidelines for low back pain, resulted in an erratum and downgrading of the evidence

level for acetaminophen. Two of his publications are also cited in the guidelines for management of osteoarthritis of the knee and hip which were developed by Osteoarthritis Research Society International (OARSI).

He has been appointed by the Cochrane Collaboration as external referee for two of their reviews, and as an external advisor for the Norwegian guidelines for low back pain management. His comments have led to the withdrawal of 3 Cochrane reviews.

Prof. Bjordal was the President of World Association for Laser Therapy (WALT) during 2008-10, and President of the 8<sup>th</sup> WALT 2010 congress in Bergen, Norway ([www.walt.nu](http://www.walt.nu)). At the moment, Prof. Bjordal is Scientific Secretary to WALT and he has been leading WALT's development of guidelines for research and clinical applications of LLLT since 2005. He is also current President in International Society for ElectroPhysical Agents in Physical Therapy, a specialist subgroup in World Confederation for Physical Therapy ([www.wcpt.org/iseapt](http://www.wcpt.org/iseapt))

### Roberta Chow MB BS (Hons) FRACGP PhD

**Dr Roberta Chow** is a general practitioner in private practice in Sydney, Australia working exclusively in pain medicine and is the President of the Australian Medical Laser Association. She is also an Honorary Research Associate at the Brain and Mind Research Institute, the University of Sydney. She has conducted research with Professor Patricia Armati, Chair of the Nerve Research Foundation into the mechanism by which low-level laser therapy relieves pain, focusing on the effects of laser on nerves.





## Tiina I. Karu

**Professor Tiina I. Karu** is the Head of the Laboratory of Laser Biology and Medicine at the Institute of Laser and Information (formerly-Laser Technology Research Center) of the Russian Academy of Sciences. She obtained her PhD (Candidate of Science in Photochemistry) in 1974 and her Doctor of Science in Biophysics in 1990 at St. Petersburg, Russia. She has been actively doing research in photochemistry, photobiology, photo physics and laser biology. She authored more than 300 publications as well as two books; "Photobiology of Low Power Laser Therapy", Harwood Acad. Publications 1989, and "The Science of Low Power Laser Therapy", Gordon and Breach, 1998". Her extensive experience and research in the field led her to become internationally acknowledge as the leading researcher into the cellular effects of laser irradiation.



## Krisztina Valter-Kocsi MD, PhD, FSOH, SFHEA(UK)

*Medical School, Eccles Institute of Neuroscience, JCSMR, ANU, Canberra Australia*

**Dr Krisztina Valter-Kocsi** is a senior lecturer in Anatomy in the ANU Medical School, and the head of the Retinal Damage and Repair Laboratory at the John Curtin School of Medical Research of the Australian National University. Her research interests range from the role of inflammation and its control following retinal injury, to the structural and functional changes of Müller cells. Her other research pursuits are in science and medical education.

Krisztina obtained her MD degree in 1986 and Ophthalmology Fellowship in 1990, in Budapest, Hungary. She completed her PhD in Medicine at the University



of Sydney in 2000. During her PhD candidature, she investigated the effects of environmental changes on the developing and adult retina. This research led to the identification and characterization of the presence of a critical period of high sensitivity in the developing photoreceptors, as well as the function and regulation of neuroprotective factors in the degenerative retina. She joined the Research School of Biology at the Australian National University in Canberra as a postdoctoral fellow, where she focused her research on cell biology-based retinal treatments, such as saffron supplement treatment and photobiomodulation. In 2011, she became a faculty member of the Medical School at ANU, and established the Retinal Cell Damage and Repair Laboratory. She joined the Eccles Institute of Medical Science at the John Curtin School of Medical Research in 2012. Her research explores the role of inflammation in the development and progression of retinal degenerations and tests therapeutic approaches that has the potential to modulate retinal immune response.

## INVITED/ABSTRACT SPEAKERS

### Heidi Abrahamse, PhD

**Prof. Heidi Abrahamse** BSc (RAU), BSc Honours (Biochemistry and Psychology; US, UNISA), MSc (Medical Biochemistry; US), PhD (Molecular biology/Biochemistry; Wits University), Executive Leadership (Gibs, UP) is currently the Director of the Laser Research Centre in the Faculty of Health Sciences, UJ. Her research interests include photobiology and photochemistry with specific reference to photodynamic cancer therapy, stem cell differentiation and wound healing. She was the recipient of the Faculty of Health Sciences highest research output for 2009 and the University of Johannesburg Vice-Chancellor's Distinguished Award for Outstanding Researcher of the Year, 2010 and the NLC Rental pool grantholder best research output for 2008, most masters graduates 2013 and most IP produced 2013. She has supervised 28 Hons; 37 masters; 11 doctorates and 7 post-doctorate fellows. Prof. Abrahamse has acted as external examiner for 16 masters and doctorate theses. She has an impressive record for successful application of several external grant applications. She has hosted 2 international conferences,



# Biographies CONTINUED

World Association for Laser Therapy in 2008 and Photodynamic Therapy Conference in 2012, supported by the DST SA/Germany year of science. In addition, she was the President of the international society, WALT for 2010 to 2012 and currently acts on the executive committee. She has been invited to present her research at several international conferences as invited, keynote or plenary presenter. In 2013 she was invited by the Russian Academy of Science to present a presentation on the research in stem cell differentiation, amongst others. Her publication record is impressive, with more than 70 peer reviewed accredited journal publications, 35 accredited full paper proceedings and 10 chapters. She serves on international councils and executive committees and serves on the editorial boards of 8 peer-reviewed internationally accredited journals, while acting as reviewer for over 30 journals. Her society memberships include, amongst others: South African Society of Biochemistry and Molecular biology; American Society for Biochemistry and Molecular Biology; American Society for Cell Biology; International Society for Optical Engineering; World Association of Laser Therapy; World Academy of Laser Applications; European Medical Laser Association; North American Association for Light Therapy, and International Society for Laser Applications. She has acted as external and panel reviewer for external funding bodies and serve on the Professional Conduct Committee: Health Profession Council of South Africa and the Academy of Science of South Africa (ASSAf) Committee on Scholarly Publications in South Africa (CSPiSA). She serves on a number of research-related university committees for both universities and science councils. She currently serves on the University of Johannesburg Council as elected Senate representative.

## Juanita J. Anders, PhD

*Professor of Anatomy, Physiology and Genetics, Uniformed Services University of the Health Sciences*

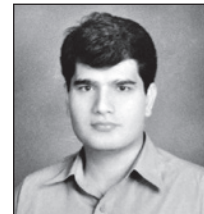


**Juanita J. Anders** is a Professor of Anatomy, Physiology and Genetics and Professor of Neuroscience at Uniformed Services University of the Health Sciences. She received her Ph.D. in Anatomy from the University of Maryland Medical School and specializes in peripheral and central nervous system injury and repair mechanisms and light tissue interactions. She is recognized as an expert in photobiomodulation and has been invited to speak and chair sessions at numerous international laser conferences. Dr. Anders serves on the Executive Councils and Scientific Advisory Boards of several laser societies. She is a past president of the North American Association of Light Therapy, a found-

ing member of the International Academy of Laser Medicine and Surgery, and currently is the President of the American Society for Lasers in Medicine and Surgery. She serves on the Editorial Boards of Photomedicine and Laser Surgery, Lasers in Surgery and Medicine, Lasers in Medical Science, Physiotherapy Practice and Research and has published over 60 peer reviewed articles.

## Shahzad Anwar, MD

*Interventional Pain Physician, Acupuncturist, Family Physician*



**Dr. Shahzad Anwar** is a Medical Doctor trained in Interventional Pain Management from the United States, England and China. He is also trained in Acupuncture from China. He has been working as an Interventional Pain Physician and Acupuncturist since 2001. He has many internationally published research studies in the fields of Neuro/Rehab and Pain Management. He integrates mainstream medicine, interventional techniques and acupuncture to treat acute pain, chronic pain and neuro-developmental diseases.

Dr. Shahzad is a nationally renowned Stress Management trainer. He has conducted over 200 workshops on Stress Management in corporate, public and private sectors.

## Praveen R Arany DDS, PhD

**Dr. Praveen R Arany** BDS, MDS, MMSc, PhD, completed his initial dental training in 1999 and his residency in Oral Pathology in 2001 from India. He did two post-doctoral fellowships in basic sciences at the Indian Institute of Sciences, Bangalore, India and National Cancer Institute, NIH, Bethesda. He then completed a PhD-Residency program at Harvard University in 2011 and was a Presidential Scholar. He also has completed two certificate programs in clinical translational research. He is currently an Assistant Clinical Investigator at the National Institute of Dental and Craniofacial Research, National Institutes of Health, Bethesda, USA.



He has over 30 publications, including 3 book chapters, and is the recipient of numerous awards such as the NCI Director's Young Investigator Award, NIH Merit Award, Wound Healing Society's Young Investigator Award, and a Eugene Seidner Scholar, among others. He has been invited to speak in various national and international forums. He serves as a reviewer for over 25 journals, editorial board of 9 journals and reviews



grants for both national and international agencies. He is also active as a member of various committees including Wound Healing Society (WHS), American Association for Dental Research (AADR), among others. Dr. Arany is currently the President-elect and Scientific Chair of North American Association for Light Therapy (NAALT), Chair of the Lasers in Dentistry special interest group of the American Dental Education Association (ADEA) and co-chair of the International Society of Optics and Photonics (SPIE) conference on Mechanisms of Low Light therapy.

Dr. Arany's research is focused on the molecular mechanisms and clinical applications of light therapy to promote wound healing and tissue regeneration. His lab attempts to identify key biological regulatory components that can be used in clinical studies to control biological outcomes. His lab uses a range of cell and molecular biology tools in tissue culture and scaffold-based model systems. Further, a large emphasis is placed on validation in animal models and moving them forward into human clinical studies. His other major areas of interest are the molecular dichotomy of wounds and tumors, cell signaling regulatory networks and Transforming Growth Factor- $\beta$  biology.

## Sandra Ayuk

Ms Sandra Ayuk (AIMLT, Medical Laboratory Technology; BTech, MTech, Biomedical Technology) is a Doctorate student at the Laser Research Centre, Faculty of Health Sciences, University of Johannesburg. She specializes in Cell biology, Phototherapy, Haematology and Blood Transfusion. She is presently working on "The role of Low Intensity Laser Irradiation (LILI) on matrix proteins and gene expression in stressed fibroblasts". In addition, she has published in four peer-reviewed journals and is a recipient of three merit awards. Presently, she is serving as the president of the African Laser Centre (ALC) student association.



## Terrance L. Baker, MD, MS

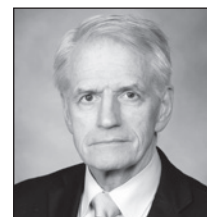
**Terrance L. Baker, M.D., M.S.** is an attending physician at Good Samaritan Hospital in Baltimore, Maryland. Dr. Baker received his BS and MS from Johns Hopkins University and his MD from the George Washington University School of Medicine. Dr. Baker is Board Certified in Family Medicine, Geriatrics and Emergency Medicine. Dr. Baker is the Founder and CEO of Sollay, Inc.,



a medical therapeutic laser practice with multiple locations in the Baltimore/Washington community. He has served as a medical therapeutic laser expert for multiple manufacturers and medical practices throughout the United States. Dr. Baker has written and lectured extensively on Laser Phototherapy.

## Jeffrey R. Basford, MD, PhD

**Jeffrey Basford, M.D., Ph.D.** has a diverse background that includes a Ph.D. in physics, teaching in the Middle East, service as an Army officer and a period of scientific consulting which culminated in completing residency training in Physical Medicine and Rehabilitation in 1980. Doctor Basford has been a member of the Department of Physical Medicine and Rehabilitation at the Mayo Clinic since 1982, where his clinical responsibilities have emphasized modalities, neurological rehabilitation and, more recently, cancer rehabilitation and the maintenance of function. Dr. Basford is currently Professor of Physical Medicine and Rehabilitation at Mayo, director of its Research Training Program and past chair of its research committee. He has served on numerous editorial boards, thesis committees and advisory panels. He has been Chair of the NIH Function, Integration and Rehabilitation Subcommittee and is past editor in chief of the Archives of Physical Medicine and Rehabilitation.



## G. David Baxter TD BSc(Hons) DPhil MBA

**Professor David Baxter** is Dean of the School of Physiotherapy, and Deputy Pro-Vice-Chancellor for Health Sciences, at the University of Otago, New Zealand; he is also a Visiting Professor at the University of Ulster, where he completed his undergraduate and doctoral training. David previously led the University of Otago's multidisciplinary Research Theme on *Rehabilitation and Disability* (2007-2011), and is currently co-director for the New Zealand National Science Challenge research consortium for *Ageing Well*.



David's research expertise is in the fields of rehabilitation; low back pain; complementary and alternative medicine, as well as in laser medicine. His current projects include physical activity interventions (principally walking interventions; photobiomodulation of delayed wound healing; and clinical effectiveness of acupuncture including laser devices as an alternative to needles in treatment of pain.

# Biographies

CONTINUED

Professor Baxter has authored or co-authored over 200 peer-reviewed research papers in high-impact peer-reviewed journals, and contributed to various textbooks including *DeLisa's Physical Medicine and Rehabilitation, 5th edition*. He is the Editor in Chief of *Physical Therapy Reviews*, and a member of the Editorial Boards of a number of other international peer-reviewed journals. He has presented multiple platform or poster presentations and educational workshops at national and international meetings.

David has been recognised as a Fellow of the *Royal Academy of Medicine in Ireland*, the *International Academy of Lasers in Medicine and Surgery*, and the *American Society for Lasers in Medicine and Surgery*; he is also an honorary life member of the *Acupuncture Association of Chartered Physiotherapists*.

## Scott D. Benjamin, DDS

**Dr. Scott Benjamin** is in private practice in rural, upstate NY and is an internationally recognized authority on dental lasers and advanced dental technologies. Dr. Benjamin is an Associate Professor and Director of Advanced Technologies and Informatics at Roseman University of Health Sciences, College of Dental Medicine. He is the Chairman of the ADA Standards Committee Working Group on Dental Lasers and is the President of the Academy of Laser Dentistry (ALD).



## René-Jean Bensadoun, MD

*Professor and Head, Radiation Oncology Department, University Teaching Hospital, POITIERS (France)*

*Private practice (2014): Centre de Haute Energie, 10 Bd Pasteur, 06000 - NICE (France)*

E-mail : [rjbensad@gmail.com](mailto:rjbensad@gmail.com)

**Dr. René-Jean Bensadoun** was born on the 28th December 1960 in ORAN. He received his MD (Faculty of Medicine, Nice, Oct. 1989), specialized post-graduate degree of Oncology, option Oncology & Radiotherapy (1989), post graduate diploma of radiobiology and radio-pathology (1990). He is currently head of the Radiation Oncology Department, Poitiers' University Teaching Hospital and Faculty of Medicine, since September 2008.

Dr. Bensadoun's fields of interest include Radiation Oncology,

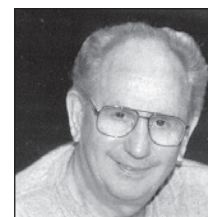
Head & Neck Cancer, Supportive Care in Cancer, Low Level Laser Therapy (LLLT), Mucositis and dermatitis management (LLLT), LLLT parameters in Oncology, New techniques in Radiation Oncology (IMRT, VMAT) and Prevention and management of cancer-treatment complications.

He serves as Membership Secretary of WALT (World Association for Laser Therapy) and Board Member of SFCCF and GORTEC (H & N Cancer French Groups). He is Head of Training and Continuing Academic Education in AFSOS (French Association for Cancer Care Support), a member of the Editorial Board of *Journal of Supportive Care in Cancer*, and a member of Mucositis Board and Oral Care Board of MAS-CC-ISOO (Multinational Association for Supportive Care in Cancer).

Dr. Bensadoun is coordinator of 5 phase III multi-center trials and three Phase II randomized studies. He has more than 110 publications on PubMed, including 51 publications as first or last author (H index: 25, May 2014).

## Antone L. Brooks, PhD

**Dr. Brooks** earned his Associate degree at DIXIE JC in St. George Utah (1958), B.S. in Experimental Biology (1961) and M.S. in Radiation Ecology at the University of Utah (1963). He received his Ph.D. in Physical Biology at Cornell University (1966).



Professor Brook's specific research interests include cytogenetics, radiation induced cancer, radiation risk, and public outreach on radiation effects. The focus of his research has been understanding the biological changes induced by low doses of ionizing radiation with special emphasis on internally deposited radioactive material. This includes radiation from both external radiation sources and from internally deposited radioactive materials. The use of biomarkers for exposure, dose, susceptibility, and disease have been a major research effort directed toward making it possible to better estimate radiation risk using short term biological endpoints. His research has resulted in over 200 open literature publications.

Dr. Antone L. Brooks is retired as a Professor from the Environmental Science Department, Washington State University Tri-cities. He was a Senior Scientist at PNNL, Manager of the Cellular and Molecular Toxicology Group at Lovelace ITRI, Albuquerque, New Mexico, and worked in Washington D.C. for the U.S. Department of Energy, Office of Health and Envi-



ronmental Research as a Technical Representative. Dr. Brooks served on many National and International review committees. He has been a member of the NCRP for over 30 years and served on the Board of Directors. He was selected to give the Taylor Lecture at NCRP and received the Meritorious Scientific Achievement award from the Health Physics Society (2012). He is currently working as a consultant for Pacific Northwest National Laboratory and the Electric Power Research Institute.

## Violet Bumah, PhD

**Violet Bumah** has a Ph.D in Biochemistry. She received Postdoctoral training at the Universities of Buea, Cameroon and Northwestern University, Chicago, with a focus on Pathogenesis and Immunology of infectious diseases. She is presently a Research Associate at the College of Health Sciences, University of Wisconsin-Milwaukee. Her research interests include investigating the pathogenesis of infectious diseases of myriad nature, in particular, Methicillin resistant *Staphylococcus aureus* (MRSA) and malaria. Her current work investigates the use of alternative therapies such as monochromatic light for MRSA eradication.



## Edward J. Calabrese, PhD

*Professor of Toxicology*

**Edward J. Calabrese** is a Professor of Toxicology at the University of Massachusetts, School of Public Health and Health Sciences, Amherst. Dr. Calabrese has researched extensively in the area of host factors affecting susceptibility to pollutants, and is the author of over 600 papers in scholarly journals, as well as more than 10 books, including Principles of Animal Extrapolation; Nutrition and Environmental Health, Vols. I and II; Ecogenetics; Multiple Chemical Interaction; Air Toxics and Risk Assessment; and Biological Effects of Low Level Exposures to Chemical and Radiation. Along with Mark Mattson (NIH), he is a co-editor of the recently published book entitled Hormesis: A Revolution in Biology, Toxicology and Medicine. He has been a member of the U.S. National Academy of Sciences and NATO Countries Safe Drinking Water committees, and on the Board of Scientific Counselors for the Agency for Toxic Substances and Disease Registry (ATSDR). Dr. Calabrese also serves as Chairman of the Biological Effects of Low Level Exposures (BELLE) and as Director of the Northeast Regional Environmental Public Health Center at the University of Massachusetts. Dr. Calabrese was awarded the 2009 Marie Curie Prize for his body



of work on hormesis. He was the recipient of the International Society for Cell Communication and Signaling-Springer award for 2010. He was awarded an Honorary Doctor of Science Degree from McMaster University in 2013.

Over the past 20 years, Professor Calabrese has redirected his research to understanding the nature of the dose response in the low dose zone and underlying adaptive explanatory mechanisms. Of particular note is that this research has led to important discoveries which indicate that the most fundamental dose response in toxicology and pharmacology is the hormetic-biphasic dose response relationship. These observations are leading to a major transformation in improving drug discovery, development, and in the efficiency of the clinical trial, as well as the scientific foundations for risk assessment and environmental regulation for radiation and chemicals.

## Christopher Carraway, DC, DIBCN, CLS

**Dr. Carraway** is a Chiropractic Neurologist with over 30 years of private practice. He is a consultant to Multi Radiance Medical Laser and lectures on the topic of laser therapy live and via webinars. He has a special interest in LLLT for the treatment of Herpes Zoster and treating various visceral disorders such as IBS, Gurd and neurogenic bladder. He practices in New Bern, NC.



## James Carroll

Founder and CEO at THOR Photomedicine Ltd. Electronics Engineer

A recognised authority on LLLT mechanisms, dose, and the measurement and reporting of LLLT parameters

Appointments :  
Biomedical Optics Society conference chair (2009 - to-date)

Fellow of The Royal Society of Medicine (2009 - to-date)

Editorial Board of Photomedicine and Laser Surgery (2008 to-date)

Served on the World Association for Laser Therapy board (WALT) (2000 - 2004) and the North American Association for Laser Therapy (2002 - 2006) is on the Scientific committee for the WALT / NAALT conference 2014



# Biographies CONTINUED

## Arun Darbar, DDS

Dr. Arun Darbar is a Multi Award winning Laser and Aesthetic Dentist, forefront of Laser Dentistry and lectures worldwide. He is a BACD (British Academy of Cosmetic Dentistry) Accredited Member, credentialing committee member and examiner. An ALD (Academy of Laser Dentistry) Board member, examiner, educator and mastership status, Co-Chairs Certification and Education committees, and also chairs International Relations. WCLI (World Clinical Laser Institute) founding member, mastership and educator status. WCMID (World Congress of Minimally Invasive Dentistry) Fellowships and Diplomat status. Dr. Darbar is also a published author and reviewer.



## Timothy J. Demchak, PhD, ATC

**Timothy Demchak** has earned his bachelor's degree in Exercise Science from Manchester University, his Masters of Science in biomechanics from Ball State University, and his Doctorate degree in Exercise Physiology from The Ohio State University. He has been a certified athletic trainer for 20 years. Currently, Dr. Demchak is an Associate Professor at Indiana State University in the Department of Applied Medicine and Rehabilitation. Additionally, he is the Director of the Orthopedic Rehabilitation Center at the Wabash Valley Medical Center. Dr. Demchak has 19 published manuscripts and 63 presentations. Dr. Demchak also serves on the Medical Advisory Board of Multi Radiance Medical.



## Mark Dincher, DDS, MS

**Mark Dincher** works as a general dentist in a group practice in central Pennsylvania at Selinsgrove Dental Arts. His primary patient focus is complex rehabilitative dentistry and craniofacial pain. He received his Doctorate of Dental Medicine at the University of Pittsburgh in 1977. In 2005, his interests in chronic pain led him to pursue his MSc in interdisciplinary dentistry with an emphasis in craniofacial pain and prosthetics at Danube University, Krems, Austria. Most recently, in 2011, Mark completed a MS in craniofacial pain at Tufts University School of Dental Medicine in Boston. During this time, he conducted a RCT on the use of LLLT in patients with TMD. He has been using both surgical and LLLT for 5 years.



## Janis T. Eells, PhD Professor of Biomedical Sciences

**Janis T. Eells** received her BS and MS degrees in Microbiology and Pharmacology from the Idaho State University and her Ph.D. in Pharmacology from the University of Iowa in 1981. She conducted postdoctoral research in Neurotoxicology at Northwestern University. She began her faculty career in 1986 at the Medical College of Wisconsin (MCW) in the Department Pharmacology and Toxicology where she initiated her studies of Photobiomodulation. At MCW and later at the University of Wisconsin-Milwaukee, Dr. Eells and her colleagues and collaborators pioneered the investigation of NIR photobiomodulation (NIR-PBM) in the treatment of retinal injury and neurodegenerative disease. Investigations into the mechanisms of NIR-PBM conducted by Dr. Eells and her colleagues have shown that far-red to near-infrared photons are absorbed by the mitochondrial photoacceptor molecule, cytochrome c oxidase triggering intracellular signaling pathways that culminate in improved mitochondrial function, increased cytoprotective factor production and cell survival. In her role as Professor of Biomedical Sciences at UWM, Dr. Eells teaches pharmacology and toxicology and conducts research in photobiomodulation. She has been a member of NAALT and WALT since 2008 and has published more than 60 peer-reviewed publications nearly 30 of which focus on photobiomodulation. She is a member of the NAALT council.



## Reza Fekrazad, DDS

*Associate Professor-Dentist, Periodontologist, Fellowship in laser in Dentistry*

**Associate Professor Reza Fekrazad** was born in 1967 in Iran. He is a dentist specializing in periodontology. He is a fellowship graduate in Laser in Dentistry from Tehran-Aachen University 2011. He is deputy of research affaires in dental faculty, AJA University of Medical Sciences. He also is deputy director of first laser research center of dentistry in Iran, and founder and head of fellowship course of laser in dentistry, Tehran University of Medical Sciences. He has published 38 articles in international and 18 articles in domestic scientific journals and has presented more than 120 presentations (oral & poster) at International congresses, and more than 180 lectures in nationally. He is head of National Committee of Laser in Dentistry of Ministry of Health and Medical Education Islamic Republic of Iran. He is on the editorial board of Photo-





diagnosis and Photodynamic Therapy Journal and four other national and international scientific journals, and reviewer in more than 10 national & international scientific journals. He has received several awards (Universities & Country). At the moment he is the President of IMLA (Iranian Medical Laser Association) and the representative of Iran & IMLA in WFLD, WALT, WALA and EPPM.

## Richard P. Felten

*U.S. Food & Drug Administration*

**Richard Felten** received his B.A. in Education-Chemistry from La Salle College in 1965 and a MS in Biochemistry from George Washington University in 1975. He joined the Government as a lab technician in 1966 working in the Bureau of Radiological Health in the Radiation Research Division. His major area of research was radiation research, eventually with emphasis on Light Bioeffects including potential photosensitizing compounds. Mr. Felten became involved in Medical Device regulatory reviews in 1984, performing consulting reviews for the Of-



fice of Device for light based devices including surgical lasers. He transferred to the Office of Device Evaluation, General Surgical Devices Branch in 1991 where he continues to review light based devices including low level light based medical devices.

## Richard Godine, DVM



**Dr. Richard L. Godine** is the owner and hospital director of Ruckersville Animal Hospital and Veterinary Laser Therapy Center, a five doctor practice small animal practice located outside of Charlottesville, Virginia. He has a special interest in laser therapy as it applies to all diseases in veterinary medicine as well as expertise in orthopedic surgery, cardiology, and ultrasonography. Dr. Godine is an adjunct professor of ultrasonography and laser therapy at the Blue Ridge College of Veterinary Technology and a member of the curriculum committee and admissions committee at the Virginia-Maryland Regional College of Veterinary Medicine. He is a past president of the Virginia Veterinary Medical Association and the current Virginia Delegate to the Ameri-



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# Biographies CONTINUED

can Veterinary Medical Association. He was recently awarded the 2014 Veterinary Service Award by the Virginia Veterinary Medical Association. Dr. Godine is married to fellow veterinarian, Dr. Caroline Godine, and has three sons and one daughter. He enjoys spending time with his family, coaching his sons in lacrosse, playing bluegrass music and getting out on the golf course.

## Francisco Gonzalez-Lima, PhD

*Professor, Department of Psychology and Institute for Neuroscience*

*University of Texas at Austin, Austin, TX 78712*



**Dr. Gonzalez-Lima** is the George I. Sanchez Centennial Professor at the University of Texas at Austin and an international research leader on brain energy metabolism, learning and memory and neurobehavioral disorders. Education/Honors: Tulane University (BS Biology/BA Psychology, with Honors); University of Puerto Rico-School of Medicine (PhD Anatomy/Neurobiology, Distinguished Alumnus Award); Technical University Darmstadt, Germany (Alexander-von-Humboldt Postdoctoral Fellow, Behavioral Neuroscience); Fellow and Founding Chair of Neuroscience, Texas Academy of Science; Fellow and USA Councilor, International Behavioral Neuroscience Society. Visiting neuroscientist in Germany, England and Canada. Delivered over one hundred invited lectures about his research around the world, and contributed over 300 scientific publications in peer-reviewed journals, conference proceedings, chapters and books.

## Sturla Haslerud

*Physiotherapist, MSc Orthopedics & Rheumatology, PhD Candidate*

*Bergen University College, Centre for Evidence-Based Practice*

*University of Bergen, Department of Global Health and Primary Care*

Sturla Haslerud is a physiotherapist with 12 years clinical experience in examination and treatment of musculoskeletal disorders. He holds a MSc in Orthopedics and Rheumatology, and is currently working on a Ph.D. thesis: *Diagnostic Assessment and Treatment of Subacromial Impingement Syndrome* at Bergen University College and University of Bergen.



## Ronald E. Hirschberg DVM

*Medical Director Brockton Animal Hospital*

**Ronald E. Hirschberg DVM** is medical director of the Brockton Animal Hospital, a four doctor clinical practice in the Boston area. He received his bachelor's degree in Chemistry with honors from Case Western Reserve University and his graduate veterinary degree from the Ohio State University in 1977. Dr. Hirschberg has practiced clinical medicine since graduation as well as operating Veterinary Business Consulting, a management and marketing service for veterinarians. He integrated LLLT into practice eight years ago and has since worked with THOR Photomedicine in creating protocols for a variety of medical conditions using primarily LED therapy. He is also a contributing author for the *Handbook of Low Level Light Therapy*, a definitive textbook to be released in late 2014 or early 2015.



## Lars Hode

**Lars Hode**, born in 1942, is a physicist, specializing in medical laser applications and working with laser phototherapy since 1983. He is the President and founder of the Swedish Laser-Medical Society 1989. Together with his friend Jan Tunér, he has written several books about laser medicine.



## Nicolette Houreld

**Dr. Nicolette Houreld N.Dip (TWR), B.Tech (TWR), M.Tech (TWR), D.Tech (UJ) Biomedical Technology** was born in Johannesburg, South Africa. Nicolette is a full time senior lecturer and researcher in the Laser Research Centre, Faculty of Health Sciences, University of Johannesburg. As a NRF (National Research Foundation, South Africa) Y2-rated (young) scientist, her field of research is laser tissue interaction and focuses on the biochemistry and molecular effects of lasers used in therapy, particularly in diabetic wound healing. She has numerous accredited publications and serves on various research-related university and science council committees, executive committees including WALT, and the editorial board of internationally accredited journals.



BIOGRAPHIES



## Ilko K. Ilev, PhD

*Leader, Optical Therapeutics and Medical Nanophotonics Laboratory, U.S. FDA*



**Dr. Ilko Ilev** has over 25 years of extensive experience and accomplishments in leading scientific institutions in the United States, Europe, and Japan in the areas of laser medicine; biomedical optics; biophotonics; nanobiophotonics; minimally invasive optical therapeutic and diagnostic technologies and devices; multifunctional bioimaging and biosensing; phototoxicity and laser safety. He received MS and PhD degrees in Laser Physics from Sofia University and Technical University, Bulgaria. Dr. Ilev has worked in Strathclyde University, Glasgow, UK, and in Institute of Physical and Chemical Research (RIKEN), Tokyo, Japan. Since 1998 he has been with the Center for Devices and Radiological Health at U.S. Food and Drug Administration (FDA) where he is the Leader of Optical Therapeutics and Medical Nanophotonics Laboratory. He was appointed to the HHS/FDA Senior Biomedical Research Service (SBRS) in 2012. Dr. Ilev is also an Adjunct Professor at the University of Maryland. He has produced more than 370 journal

papers and abstracts. Along with multiple original publications, he holds 11 granted and pending patents. He served as Biophotonics Committee Chair of the IEEE Photonics Society and IEEE Lasers and Electro-Optics Society. He has organized and chaired numerous conferences on biophotonics and nanobiophotonics topics within the IEEE Photonics Society, IEEE Engineering in Medicine and Biology Society, SPIE International Society for Optical Engineers, and Optical Society of America. He serves as Primary Editor of the IEEE Journal of Selected Topics in Quantum Electronics on Biophotonics and Nanobiophotonics, as Associate Editor of the IEEE Transactions on Biomedical Engineering, and in Editorial Board of IEEE Photonics Journal. Dr. Ilev is a Fellow of IEEE.

## Peter A. Jenkins, MBA



**Peter Jenkins** holds an MBA from the University of Western Sydney, and served 12 years in the Royal Australian Air Force prior to entering the field of laser medicine 18 years ago.



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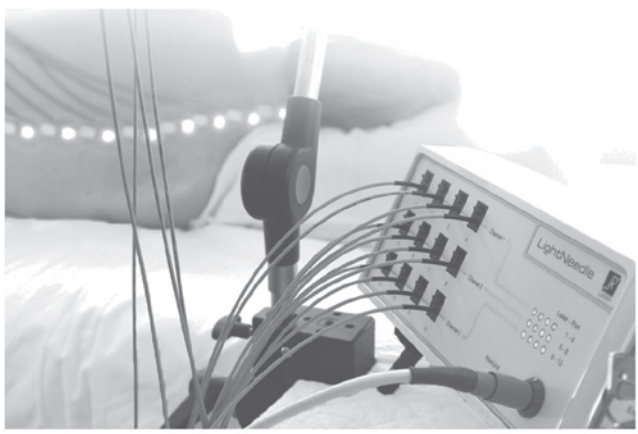
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Peter is the founder, owner and Director of Technology and Education for SpectraVET Inc and SpectraMedics Pty Ltd, and an Executive Director of Immunophotonics Inc. He is also a founding member of the Australian Medical Laser Association, a member of Standards Australia Committee HE-003-12 which is responsible for Australian Standard AS/NZS 4173: 'Guide to the safe use of lasers in healthcare', and a reviewer for numerous professional journals.

Peter's technical experience includes the specification and development of medical and veterinary laser devices for manufacture, maintenance, reliability, usability and, most importantly, efficacy. He is a prolific writer and passionate educator, who sees market education as the key to improving standards in the laser phototherapy industry and holding manufacturers and marketers accountable for the claims they make.

## Douglas Johnson, ATC, EES, CLS

**Douglas Johnson, ATC, EES, CLS** is a certified athletic trainer with over 20 years of clinical/industrial experience. He attended Wayne State University and The University of Detroit-Mercy where he earned a Summa Cum Laude Bachelors of Science degree in Sports Medicine in 1994.



He is the Senior Vice President, Clinical and Scientific Affairs at Multi Radiance Medical and is involved in numerous research studies involving super pulsed laser. Recently, he was named as a clinical advisor to Laser Therapy U, invited to speak at the Annual 2014 NATA Symposium and Euroscience in London, England about Laser Therapy and a member of the NAALT/WALT Scientific Education Committee for the 2014 Program. He studied the effect of super-pulsed laser and light emitting diodes phototherapy on non-specific knee pain which was published in *Lasers in Medical Science*, May 2014, and is a reviewer for the *Journal of Athletic Training*.

## Ann Kobiela Ketz, MN

**MAJ Ann Kobiela Ketz, MN/RN** (U.S. Army Nurse Corps), is a candidate working towards a Ph.D. in Nursing at Uniformed Services University of the Health Sciences in Bethesda, MD. Ann earned her B.S.N at Cedarville University in 1998 and her M.N. at University of Washington, where she completed a thesis on phantom limb pain in traumatic amputees. Her 15 years of active duty nursing experience includes clinical medical/surgical, intensive care, emergency care, pediatrics, and oncology



nursing roles. Most recently, she served as the medical/surgical Clinical Nurse Specialist at Landstuhl Regional Medical Center in Landstuhl, Germany. Her dissertation work is entitled *Neuropathic Pain: Characterization and Modulation of the M1/M2 Monocyte Spectrum*. She can be reached at [ann.ketz@usuhs.edu](mailto:ann.ketz@usuhs.edu).

## Imran Khan, PhD

**Dr. Imran Khan** obtained his PhD from Indian Institute of Science (Bangalore, India) exploring the role of TGF- $\beta$  in Oral Submucous Fibrosis. He is currently working as a Post-doctorate Fellow at National Institute of Dental and Craniofacial Research (NIDCR) in National Institute of Health (NIH) on molecular characterization of laser induced photobiomodulation and phototoxicity.



## A/Prof Liisa Laakso

**A/Prof Laakso** is Head of Physiotherapy in the School of Allied Health Sciences at Griffith University, Australia. Dr. Laakso's research interests include using low level laser therapy (LLL) for pain management, tissue healing, and inflammation in non-malignant and malignant models. A/Prof Laakso is Co-Chair of WALT2014/NAALT Congress and President of WALT.



## Ernesto Cesar Pinto Leal-Junior, Prof. PhD, PT

**Ernesto Cesar Pinto Leal-Junior, PT, PhD** has a bachelor degree in Physiotherapy from Brazil, 2002. In 2004, he received his Master's degree in Biomedical Engineering at University of Vale do Paraiba (UNIVAP) in Brazil, and he defended his PhD thesis in 2010 at University of Bergen - Norway (Section of Physiotherapy Science, Department of Public Health and Primary Health Care, Faculty of Medicine and Dentistry). In 2012 he finished his Post-Doctoral at the Department of Pharmacology of University of Sao Paulo.



Dr. Leal-Junior has been a lecturer at 2 Universities in Brazil (Unilasalle University and University of Caxias do Sul) between February 2005 and July 2009, and is a reviewer of several international peer-review journals, specifically in the Phototherapy and Sports Science fields (Photomedicine and Laser Surgery, Lasers in Medical Science, Physiotherapy Research International, Journal of Sports Sciences, Journal of Photo-

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chemistry and Photobiology B: Biology, and Photochemistry and Photobiology). Since April 2014, he has been a member of the editorial board of Photomedicine and Laser Surgery. His current position is as Full Professor at Nove Julho University in Sao Paulo, Brazil.

His expertise is research in phototherapy in skeletal muscle disorders. A special interest has been developed in phototherapy research (Low-Level Laser Therapy and Light Emitting Diode Therapy) for skeletal muscle fatigue delaying, performance enhancement, injury prevention and recovery after strenuous physical activity.

Currently, Dr. Leal-Junior has had 70 scientific papers published, 48 of them in international peer-reviewed journals (indexed by Pubmed/Medline). This includes 2 papers recently accepted in international journals. He has presented more than 40 scientific papers at National and International Congresses and in September 2011, Dr. Leal-Junior was awarded by NAALT with the Mary Dyson Clinical Photomedicine Young Investigator Award.

### **Ann Liebert, PhD candidate**

**Ann Liebert** is conducting a doctoral research program at the University of Sydney, Australia, into the application and understanding of clinically applied low-level laser. She has conducted research into asymmetries in cervicogenic headache (Physiotherapy Theory and Practice, 2013), the effect of skin pigment on laser transmission and the importance of channelopathies in therapy, and presented some of this research at the 9<sup>th</sup> WALT Congress at the Gold Coast in 2012 (Liebert et al, 2013, Proceedings of the 9th WALT Congress). Recent research has resulted in the development of a model about neural transmission by protein-to-protein transfer of information (Liebert et al, 2014, Protein conformational modulation by photons: A mechanism for laser treatment effects, Medical Hypotheses). She was invited to present this work at the 4<sup>th</sup> International Protein and Peptide Conference (PepCon) in Dalian, China in 2014 with emphasis on the protein interactions. Ann has recently submitted for publication an invited review entitled “Prion Signaling in the Nervous System – A Perspective” for the journal Signal Transduction Insights.



### **Steve Liu, LAc**

**Steve Liu** is a licensed acupuncturist with a degree in electrical engineering. He and his acupuncturist wife, Wen, have clinic in Tucson, Arizona. He combines low-level laser therapy with acupuncture to treat acute and chronic pain condition since 2000 when he first researched on the clinical use of laser. He is a member of the North American Association for Laser Therapy since 2001 and served as its president in 2008 and 2009. He is also the founder and president of American Society for Laser Acupuncture Therapy. Besides practicing acupuncture and laser acupuncture, low-level laser therapy, Functional Medicine, and Chinese herbal medicine, Steve also coaches patients on whole-food, plant-based lifestyle. Steve is a marathon runner and wishes to run 100th marathon on his 100th birthday. When he is not running, he enjoys reading books on universe and practicing tai chi, yoga, and playing Badminton and chess with his wife and daughter.



### **Nicole L. Lohr, MD PhD**

*Assistant Professor of Medicine, Medical College of Wisconsin*

*Clement J Zablocki VA Medical Center*

**Dr. Lohr's** interest in research began as an undergraduate at Marquette University where she performed research on the transcriptional regulation of genes in *Drosophila*. Upon graduation in 1998, she joined the Medical Scientist Training Program at the Medical College of Wisconsin to pursue an MD and PhD in cardiovascular physiology. Under the mentorship of Dr. William Chilian, she identified unique proteins in the development of coronary collateralization. After completion of medical school, she pursued a research centered Internal Medicine residency and Cardiology fellowship. During this period, with the assistance of Dr. David Warltier, she developed interest in the mechanisms by which photon energy increases nitric oxide. She continues this work as an Assistant Professor and Cardiologist at the Medical College of Wisconsin and the Clement J Zablocki VA Medical Center in Milwaukee, WI.



# Biographies CONTINUED

## Rodrigo Alvaro B. Lopes-Martins, PhD

**Dr. Martins** graduated in Biological Sciences from the Federal University of Rio de Janeiro (1991), Masters in Pharmacology from the State University of Campinas (1994) and Ph.D. in Cell and Molecular Biology by the Oswaldo Cruz Foundation (1998). Held his Postdoctoral from University of São Paulo. Associate Professor Professor at Faculty of Medical Sciences, UNICAMP. Currently he is Professor at The University of São Paulo, where he coordinates The Laboratory of Pharmacology and Experimental Therapeutics. He is an Associate Professor at the University of Bergen (Norway), and the Department of Physical Therapy, Faculty of Medicine, University of Lorraine (France). Has experience in the area of Biomedical Engineering, with emphasis on Low Level Laser in Medicine, acting on the following themes: low-power laser on musculoskeletal inflammatory diseases. It also works with the pathophysiology and pharmacology of musculoskeletal inflammatory diseases, and rheumatic joints, fatigue and injury of skeletal muscle in different situations such as diabetes, hypercholesterolemia, among others. He also investigates the effects of Low Level Laser Therapy in Experimental models of Cancer. Professor Rodrigo Alvaro Lopes-Martins has published more than 100 Scientific papers, supervised 26 Master Students, 9 PhDs and 5 Post-doctor Fellows. He was the mentor, founder and Director of the First Graduate Program (Master and PhD) in biophotonics applied to health sciences with emphasis in phototherapy in Brazil. Professor Lopes-Martins has been taking part of WALT since 2004 and became a member of the Executive Committee in 2008 as Scientific Secretary. In 2010 he took over the position of WALT Secretary General, until now.



joined the faculty of the Department of Health Sciences, Clinical Laboratory Sciences Program, at the University of Wisconsin – Milwaukee. She is currently an Associate Professor and Chair of the Biomedical Sciences Department at UWM. Her current research interests include investigation of near infrared light as an adjunct therapy for the treatment of multiple sclerosis.

## Angela Magri

Bachelor in Physiotherapy by University Center of Educational Foundation Guaxupé - UNIFEG (2007-2011). Master Degree in Sciences by Program of Interdisciplinary Postgraduate in Health Sciences, Universidade Federal de São Paulo - UNIFESP (2012-2014). Currently is a doctoral student by Program of Interdisciplinary Postgraduate in Health Sciences, UNIFESP (2014). Conducts research on the following topics: low-level laser therapy, diabetes mellitus type 1, biomaterials and tissue repair, with emphasis on bone repair.



## Mark P. Mattson, PhD

*Chief, Laboratory of Neurosciences, National Institute on Aging*

**Mark Mattson** is Chief of the Laboratory of Neurosciences at the National Institute on Aging, and a Professor of Neuroscience at Johns Hopkins University School of Medicine in Baltimore. His research is aimed at understanding molecular and cellular mechanisms of brain aging and the pathogenesis of Alzheimer's, Parkinson's and Huntington's diseases, and stroke. His work has elucidated how the brain responds adaptively to challenges such as fasting and exercise, and he has used that information to develop novel interventions to promote optimal brain function throughout life. He has published more than 800 articles and has an 'h' index of over 165. He has received many awards including the Metropolitan Life Foundation Medical Research Award, the Alzheimer's Association Zenith Award, the Santiago Grisolia Chair Prize, and he is an AAAS Fellow. For more information visit: <http://www.irlp.nia.nih.gov/branches/lns/mcnu.htm>.

## Dr. Graham Merry, MB, BS (Lond), LMCC

**Dr. Graham Merry** graduated in Medicine from the Royal London Hospital Medical College in the U.K. 1982. He immigrated to Canada and worked within



## Jeri-Anne Lyons, PhD

**Jeri-Anne Lyons, PhD**, completed her Bachelor of Science in Medical Technology from the University of Wisconsin-Stevens Point in 1989. She earned her PhD in Microbiology/Immunology from the Medical College of Wisconsin in 1997 under the guidance of Dr. Robert Fritz, studying T cell migration into the central nervous system in an animal model of multiple sclerosis. She was a fellow of the National Multiple Sclerosis Society from 1997-2000, studying the role of B cells and antibody in MS pathogenesis under the guidance of Dr. Anne Cross at Washington University School of Medicine in St. Louis, MO. She remained at Washington University until 2003, when she





the Underserved Area Program as a general practitioner for several years. He undertook two years of Ophthalmology Residency at the University of Toronto. He has been involved in several clinical trials as a principal investigator and consultant, all dealing with Age-related macular degeneration (AMD).

He is actively involved in several clinics providing both primary and secondary Ophthalmology care and is director of the Photospectra clinic providing “off label” PBM treatments for patients with dry AMD in Canada.

He is a co-founder of LumiThera Inc., this U.S. Company aims to prove and provide PBM for dry AMD globally.

### **Eduardo Foschini Miranda, PhD**

*Rehabilitation Sciences, Physiotherapist*

**Eduardo Foschini Miranda** is a Postdoctoral fellow in Biophotonics Applied to Health Sciences from Nove de Julho University, participates in the research group of therapeutic applications of Biophotonics; PhD in Rehabilitation Sciences from Nove de Julho University, MSc in Rehabilitation Sciences from Nove de Julho University - research group of assessment and rehabilitation of Cardio-pulmonary Dysfunctions and graduated in physiotherapy from Nove de Julho University.



### **Ingvill Fjell Naterstad, PhD Candidate**

*Department of Global Public Health and Primary Care, University of Bergen*

Ingvill Fjell Naterstad graduated as a physiotherapist in 2008 and received her masters degree in clinical physiotherapy from Bergen University College in 2012. She is currently employed at the University of Bergen as a PhD candidate.



### **Professor Uri Oron, PhD**

**Professor Uri Oron** received his B.Sc and Ph.D (Biology) from Tel-Aviv University in Israel. Harvard University: Post doctoral training in muscle physiology at Harvard University 1977-1979. In 1979 joined the academic staff of Tel Aviv University, Faculty of Life Sciences where he is currently a full professor. Main field of in-



terest is Regenerative Medicine. Sabbatical years (1985-86) at Case Western Reserve University (muscle and bone regeneration) and another year (2002-3) at UCSD and PhotoThera Inc. working on biomodulation of ischemic heart by low level laser therapy. Prof. Oron is an author of more than 90 peer reviewed scientific papers, 35 of which are on biostimulation of cells and tissues with low level laser therapy.

### **Narda G. Robinson, DO, DVM, MS, FAAMA**

*Director of the Colorado State University Center for Comparative and Integrative Medicine*



*Medical Director and Educational Architect for OneHealth SIM*

**Dr. Narda Robinson**, both an osteopathic physician and veterinarian, directs the Colorado State University Center for Comparative and Integrative Medicine where she incorporates laser therapy for a range of species as part of a comprehensive integrative medicine service, alongside acupuncture, manual therapy, and botanical medicine. She is also the medical director and educational architect for OneHealth SIM, an online teaching academy that instructs participants on scientific integrative medicine (SIM). Dr. Robinson teaches photomedicine at CSU and has researched the effects of laser therapy on dogs following snake envenomation.

### **Shimon Rochkind, MD, PhD**

Dr. Shimon Rochkind is a specialist in Neurosurgery and Microsurgery and Director, Division of Peripheral Nerve Reconstruction, Department of Neurosurgery at Tel Aviv Sourasky Medical Center, Tel Aviv University, Israel. He is Fellowship Director, Microsurgery for Peripheral Nerve at the Tel Aviv Sourasky Medical Center for a fellowship affiliated by American Society for Peripheral Nerve, Vice President of Peripheral Nerve Surgery Committee of the World Federation of Neurosurgical Societies, and Peripheral Nerve Training Course Instructor of World Federation of Neurosurgical Societies.



Dr. Rochkind's scientific and clinical interests include clinical development and use of modern microsurgical and reconstructive approaches for treatment of peripheral nerve, brachial plexus, cauda equine and lumbo-sacral plexus; experimental studies on reconstruction of complete peripheral nerve and spinal cord injury using nerve cell and tissue engineering

# Biographies CONTINUED

technology; and clinical and experimental development of laser technology and methodology for treatment of injured peripheral nerve.

He is Editor of 3 international medical and scientific journals, Editorial Board Member of 8 international medical and scientific journals, and Reviewer of 33 international medical and scientific journals. He has been the recipient of 7 international and 3 national awards for basic and clinical research, including Outstanding Teacher Award, Sackler Faculty of Medicine, Tel Aviv University. He has been awarded 16 Grants, including by the Ministry of Defense, FP7 Consortium (EU), Teva Pharmaceutical Industries, and Johnson & Johnson. Dr. Rochkind has 8 international patents for scientific developments and has authored 64 peer review articles, 7 review papers, 4 case reports, 15 proceedings and 27 chapters in books.

## Gerry Ross, DDS

**Dr. Gerry Ross** has been practicing dentistry for over 40 years in Tottenham, Ontario as a general dentist who specializes in TMJ Treatment. He has been using lasers, both low level and surgical, since 1990, and has lectured extensively in Canada, the United States and Internationally. He has given lectures at numerous meetings including The Academy of Laser Dentistry, NAALT, WALT, ASLMS and Ontario Dental Association. He holds advanced proficiency status from the *Academy of Laser Dentistry (ALD)* and a fellowship from the *American Society of Laser Medicine and Surgery (ASLMS)*.



Dr. Ross has written many articles on the use of Low Level Laser Therapy (LLLT) in Dentistry, which have been published in such journals as *Ontario Dentist*, *Oral Health*, *the Journal of the ALD* and, *The Academy of General Dentistry (AGD)*. He has also written a guest editorial for *Photomedicine and Laser Surgery*. Dr. Ross holds memberships in the ALD, ASLMS, Ontario and Canadian Dental Associations, WALT, and NAALT.

## Anita Saltmarche RN, BScN, MHSc

**Anita Saltmarche** is presently the principal of Saltmarche Health and is a member of the Medical Advisory Board of Laser Therapy U. Photobiomodulation has been a major focus for Anita during the past fourteen years. In her consulting and senior level positions in photobiomodulation, she has developed comprehensive Treatment Manuals and pro-



ocols and provided clinical direction and support to clinicians and academic centers across the US, Canada and Europe. She has also been responsible for regulatory clearances and affairs and assisted manufacturers with the development of new and innovative products. Anita co-chaired the *Standards Committee for Terminology* and served as Secretary of the North American Association of Light Therapy (NAALT).

Anita regularly lectures at physical therapy, chiropractic, chiropody/podiatry and nursing programs at American and Canadian colleges and universities as well as providing educational programs for individual clinics. Ongoing practice and research endeavours include both clinic and home use of photobiomodulation for rehabilitation and pain indications, smoking cessation, traumatic brain injury, ADD/ADHD, depression and other neurological conditions.

## Sharon Tilley

**Sharon Tilley** is a Principal Physiotherapist at the Lymphoedema & Laser Therapy clinic in Adelaide, South Australia. Together with Flinders University, this clinic undertook inaugural research investigating the effects of low level laser on breast cancer related lymphoedema in 1995.



She has been a specialist physiotherapist in the area of lymphatic management since 2000, with a particular clinical interest in the use of low level laser therapy.

In 1989, while working in the position of Outpatient Senior at the Royal Darwin Hospital she purchased her first laser, predominately for use in the area of hand rehabilitation. She now has 11 lasers in her current clinic. She has been published in the UK Journal of Lymphoedema and has presented for, and held committee positions within, the Australian Physiotherapy Association, the Australasian Lymphology Association and the Australian Medical Lasers Association.

## Patricia A. Trimmer, PhD

**Dr. Trimmer** received her Ph.D. in Anatomy from the University of Maryland at Baltimore. She obtained post-doctoral appointments in Pharmacology at the University of North Carolina and in Neurosurgery at University of Virginia. She joined the faculty of the University of Virginia as Assistant Professor in the Department of Neurosurgery. Later, while in the Neurology Department,



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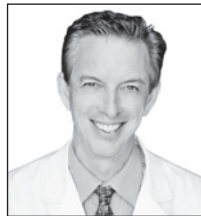


she was promoted to Associate Professor. In 2010, Dr. Trimmer moved to Virginia Commonwealth University to become Associate Professor in the Department of Anatomy and Neurobiology and a member of the Parkinson's and Movement Disorders Center. Since 1993, Dr. Trimmer's research has focused on the role mitochondrial dysfunction plays in neurodegenerative diseases like Parkinson's and Alzheimer's disease. In 2005, she started exploring photobiomodulation with a focus on the mechanisms of low-level light therapy for Parkinson's disease. She is currently a member of the Neural and Oxidative Metabolism and Death Study Section of NIH.

## Jerome True, DC, FIACN

*Chiropractic Neurologist*

**Dr. Jerome True** has over 25 years of practice experience in functional neurology, clinical nutrition and wellness care. He has utilized laser therapy as a primary modality in his practice for over 10 years. He graduated from Cleveland Chiropractic College in Kansas City, MO with honors. He completed his training in Neurology through New York Chiropractic College. He is on the board of directors for North America Association for Light Therapy (NAALT). Dr. True is highly regarded in the profession of Chiropractic Medicine as an authority in neurology, laser therapy and clinical nutrition. He has lectured throughout United States on the topic of laser therapy for multiple continuing education venues. Dr. True is the co-author of the textbook on neurology titled: "Myelopathy, Radiculopathy and Peripheral Entrapment Syndromes" published by CRC Press in 2002. He contributed to the sports medicine textbook "Conservative Management of Sports Injuries" by Thomas Hyde. Dr. True has written many articles on a wide range of topics in laser therapy, healthcare and neurology. He has provided expert opinions for multiple laser therapy device companies to refine protocols and improve treatment efficacy of their devices. He maintains a consulting practice for second opinions and challenging cases in Stuart, FL.



## Patrícia Gabrielli Vassão, Master Degree

**Patrícia Gabrielli Vassão** has a Bachelor in Physiotherapy from Federal University of São Paulo (UNIFESP) developed Scientific Initiation in the search line on mechanism of action of lasertherapy in fatigue muscle in elderly women and extension Project in Physical Activity Program in the Third Age. She is currently a student of the Master's



Graduate Interdisciplinary Program in Health Sciences at Federal University of São Paulo (UNIFESP) in the Department of Biosciences. Acts in the line of research on effects of low level laser therapy and exercise on performance in elderly women in the Center for Studies Psychobiology and Exercise.

## Michael Weber, MD

**Dr. Michael Weber** is a degreed biochemist and MD. He has been practicing medicine since 1983. He was educated in the University Clinic of Gottingen and has worked in research for the Max Planck Institute for Experimental Medicine in the field of gastrointestinal hormones. Since 1988, he has been owner and Managing Director of a public clinic in Lauenforde, Germany for general and internal medicine. He holds Acupuncture A and B diplomas. He is owner and Managing Director of the Medical Center for Acupuncture, Laser Treatment and Research at the Hospital Neu Mariahilf, University of Gottingen.



Dr. Weber is an authorized educator for general medicine, natural medicine and acupuncture. He is President of the International Society for Medical Laser Applications (ISLA), co-editor of the journal *Pain and Acupuncture*, and member of the editorial Board of *Medical Acupuncture*, the official journal of the American Academy of Medical Acupuncture.

Dr. Weber has lectured throughout Europe, the Middle East, Asia, Australia, Canada and the United States. He has 15 peer reviewed publications. He is a member of the European Medical Laser Association (EMLA), the European Academy of Acupuncture and Auriculomedicine (EAAAM), the German Medical Association for Acupuncture (DAGfAN) and the Austrian Society for Controlled Acupuncture (OGKA).

# Presentation Summaries

## KEYNOTE ADDRESSES

**Krisztina Valter-Kocsi MD, PhD, FSOH, SFHEA(UK)**

### *670nm – A Stop Sign for Retinal Degenerations?*

Age-related macular degeneration is the leading cause of blindness in the Over 50 population in the Western world. The disease affects central vision, robbing the sufferer of the ability to read, drive or recognize faces. The initiating event of the disease involves the damage and loss of photoreceptors in the macula, the retinal area, specialized for acute and colour vision. Central to its pathology are the activation of immune response and the presence of oxidative stress in the outer retina that are responsible for the progression of the disease, leading to devastating visual loss. In the majority of cases, no treatment can be offered. Using the light- and the oxygen-induced retinal degeneration animal models, my laboratory is exploring the effects of 670nm light treatment on the injured retina. This keynote presentation will review our results to date, ideas on action mechanisms and our most recent findings.

**Roberta Chow MB BS (Hons) FRACGP PhD**

### *Beyond Action Potentials - Neuronal Cytoskeletal Signaling as a Mechanism for the Long-Term Effects of Low-Level Laser Therapy*

The ability of photons to modify electrical signaling in peripheral nerves has been unequivocally demonstrated and is of primary importance in pain modulation. Photons, both visible and infrared, also cause important structural changes in the cytoskeleton, seen as irregular “beading” or varicosities, along the axon. The cytoskeleton is the axonal infrastructure for anterograde and retrograde transport of mitochondria and other vesicles to and from the cell body of the neuron. Reversible disruption of the cytoskeleton has profound effects on translocation of ion channels, NGF and other signaling molecules. This is important in relieving chronic pain as well as in nerve repair. Morphological differences between CNS and PNS neurons means that modulation of the cytoskeleton of CNS neurons has the potential for modulation of CNS disease. The signaling cascade mediated by cytoskeletal

scaffolding changes has important clinical consequences in both the PNS and CNS and is another light-mediated signaling system.

**Jan M Bjordal, PT, PhD**

### *Current Barriers for LLLT/PBM to Become Mainstream Clinical Medicine*

Phototherapy with various light sources has been around for nearly half a century, but still lacks acceptance in most areas of mainstream medicine. This may seem as a paradox in light of the discovery of specific phototherapy mechanisms of action and their dose-response patterns, supported by results from more than 200 randomized controlled clinical trials.

This lecture explores the current scientific status and barriers that may hamper a wider implementation of phototherapy. A variety of factors reinforce the existing paradigm of surgery- and pharma-dominated mainstream medicine. Conflicts of interest among decision-makers are more common than many people realize. Complexity is another barrier with technical and procedural heterogeneity, and maybe too wide definitions of therapies as key factors. From a scientific point of view, it is surprising to see how often regulating bodies and guideline makers have summarized the phototherapy literature in unsystematic and methodologically inadequate ways. Time has come to change this situation.



## INVITED TALKS & THEMATIC SESSIONS

**Prof Heidi Abrahamse, PhD**

### *Differentiation Potential and Genetic Expression Profile of Adipose Derived Stem Cells in Response to Low Intensity Laser Irradiation*

Adipose derived stem cells (ADSCs) isolated from adipose tissue are isolated with ease and in large amounts. Stem cells have two major characteristics of self-renewal and differentiation into one or more types of specialized cells. These cells are now being used to treat several degenerative diseases due to their ability to differentiate into different cell types. Our work has focused on the potential augmentation of low intensity laser irradiation on ADSCs to differentiate into smooth muscle cells (SMCs) with the view of using as therapeutic modality in regenerative medicine. The effect of different wavelength and fluence of irradiation were used to identify laser parameters affecting viability and proliferation of ADSCs. Throughout the project, suitably recognized stem cell markers were used to characterize and confirm stem cells as well as potential differentiation. In addition, dose responses were performed to determine suitable growth factors and concentrations that would induce differentiation into smooth muscle cells. Our results confirm that laser irradiation induce increased viability and proliferation as well as improve the differentiation potential of ADSCs into SMCs using optimal growth factor combinations. In addition, our results suggest that ADSCs have the ability to differentiate into SMCs while LILI potentially augments the differentiation potential and need. This further highlights the significant role that LILI has to offer in the use of ADSC therapy in regenerative medicine.

**Juanita J. Anders, PhD**

### *PBM/LLLT Dose: Are We There Yet?*

In this presentation, the current state of dosing recommendations will be reviewed. The “Class Wars” will be critically reviewed. An important part of proper dosing that will be discussed is the location of the target tissue and the depth of penetration of various wavelengths. Questions related to dose will be raised for constructive, lively follow up discussion including: Is there any justification for using multiple wavelengths simultaneously? Is there any solid data for pulsing protocols that are currently used in the clinic? Are claims of deeper penetration by super-pulsed lasers justified?

**Praveen R Arany DDS, PhD**

### *Mechanisms of PBM for Therapeutic Application of Dental Stem Cells*

This presentation will outline our recently published work on the mechanism and ability of low power lasers to induce directed differentiation of dental stem cells to dentin, a mineralized tooth structure within the tooth. We have observed the ability of low power laser treatment to activate a latent growth factor complex, TGF- $\beta$ 1. We have dissected the precise photophysical and photochemical processes that contribute to the activation of the growth factor following laser treatments involving generation of ROS and the redox sensitive amino acid residue on the growth factor. Given the potent roles of ROS and TGF- $\beta$ 1 in many biological processes, this work outlines potential modes of clinical applications of low power lasers in various pathophysiological contexts such as alleviation of pain or inflammation, immunomodulation, wound healing and tissue regeneration.

**Sandra Ayuk**

### *Low Intensity Laser Irradiation At 830 Nm Alters Gene Expression Pattern And Cellular Responses In Diabetic Wound Healing Invitro*

The release of extracellular matrix (ECM) proteins, growth factors, cytokines as well as the expression of genes in diabetic wounds is affected by Low Intensity Laser Irradiation (LILI). The study aimed to evaluate the role of LILI on gene expression in the ECM in wounded fibroblasts at a wavelength of 830 nm. Stressed models (Normal and Diabetic) of isolated human skin fibroblasts (WS1) were irradiated with a continuous wave diode laser. Forty eight hours post-incubation, RNA was reverse transcribed into cDNA and utilised as a template in real-time qualitative polymerase chain reaction (qPCR). The results showed up and down-regulation of 20 genes each in normal wounded cells, as well as 9 up-regulated and 33 down-regulated in diabetic wounded cells. This indicates that laser phototherapy modulates the expression of genes which may trigger an immune-response. A better understanding will create a breakthrough for LILI as an alternative treatment for difficult to heal wounds.

# Summaries CONTINUED

**Violet Bumah, PhD**

## *The Viability Of Blue Light Irradiated Human Cells*

**Bumah VV<sup>1</sup>, Masson-Meyers DS<sup>1</sup>, Da Silva TS<sup>2</sup>, Post ZR<sup>1</sup>, Whelan H<sup>3</sup> & Enwemeka CS<sup>1</sup>**

<sup>1</sup>College of Health Sciences, University of Wisconsin-Milwaukee, Milwaukee, USA

<sup>2</sup>College of Letters and Sciences, University of Wisconsin-Milwaukee, Milwaukee, USA

<sup>3</sup>Department of Neurology, Medical College of Wisconsin, Milwaukee, USA

This study investigates the effects of blue light on the viability of some human cells present at the site of an infection *in vitro*. Data indicates that irradiation of fibroblasts, Jurkat T-cells and THP-1 monocytes with the various doses of 470 nm blue light investigated, produced no significant differences in cell viability compared to controls. However some morphological changes in fibroblasts were observed at 110 J/cm<sup>2</sup>. These findings provide valuable insight towards advancing the development of safe technologies for MRSA eradication.

**Antone L. Brooks**

## *The Impact of Research on Low Doses of Ionizing Radiation on Cancer Risk Estimates*

Modern advances in molecular and cell biology were combined with new detection techniques to study biological responses to low dose and low dose-radiation exposure. This made it possible to detect biological changes following very low doses which were not possible in the past. In the past, all standards were based on human epidemiological data using a linear-no-threshold model (LNT) to extrapolate data from the high to the low dose region. The mechanistic data derived on the responses in the low dose region indicated that the LNT model overestimates risks. To be able to use mechanistic data to help with regulations and standards the data in the low dose region were put into a framework of critical pathways to cancer and the key events along those pathways that can influence the outcome and modify cancer frequency. This approach has been used for years by EPA to set standards for chemicals. With this approach, the data suggest that the current standards are appropriate and may be overly conservative.

**Edward J. Calabrese, PhD**

## *HORMESIS: Adaptive Responses in Biology and Medicine*

This presentation provides an assessment of hormesis, a dose-response concept that is characterized by a low-dose stimulation and a high-dose inhibition. It will trace the historical foundations of hormesis, its quantitative features, mechanistic foundations, and its biomedical/clinical applications. It will be argued that hormesis is the most fundamental dose response, significantly outcompeting other leading dose-response models in large-scale, head-to-head evaluations used by regulatory agencies such as the EPA and FDA. The hormetic dose response is highly generalizable, being independent of biological model, endpoint measured, mechanism, chemical class, physical agent (e.g., ionizing and non-ionizing radiation) and inter-individual variability. Hormesis also provides a framework for the assessment of chemical mixtures, incorporating the concept of additivity and synergism. Because the hormetic biphasic dose response represents a general pattern of biological responsiveness, as well as quantitatively defining the limits of biological plasticity, it is expected that it will become progressively more significant within toxicological evaluation and risk assessment practices as well as having numerous biomedical applications, some of which will be emphasized in this presentation.

**James D Carroll**

## *The Roadmap for LLLT to Become a Mainstream Medical Procedure*

The path from “bench to bedside” is fraught with challenges for all new medical devices. LLLT/PBM is one of the most exciting technologies on the medical horizon, it solves several significant unmet medical needs at relatively low cost and has no apparent side effects, yet it shows no immediate signs of significant commercial success. Why is this? The normal medical device barriers in the USA include FDA clearance, reimbursement, standard care guidelines and opinion leader support. Many LLLT devices have achieved FDA clearance but not reimbursement, standard care guidelines or opinion leader support. The roadmap for LLLT/PBM to get from “bench to bedside” also needs to take into normal account market acceptance phases as illustrated by the “technology adoption life cycle” and the “Gartner Hype-Cycle”. The LLLT/PBM industry hinders its own progress by producing products that do not perform to claimed specification, researchers misreport report beam and



dose parameters and there are a myriad of radiometric terms that doctors and therapists are not familiar with. LLLT has to be easier and published in high impact factor journals.

**Timothy J. Demchak, PhD, ATC**

### ***Using Laser to Treat Fibromyalgia Syndrome: Clinical Case Series***

Fibromyalgia Syndrome (FS) primary symptom is widespread pain that changes location and intensity daily. Methods: Case series of 3 FS patients successfully treated utilizing clinical and home laser units. Multi Radiance Medical Devices used: MR4-Laser Shower TQ-Solo and Pain-Away (SPL905nm; IR875nm; Red670nm; 25W) All treatments were 2-3 minutes direct contact on each identified sensitive point. Overall treatment dose was dependent on the number of treatment sites, which varied daily. Results: Case-1 Total number of sensitive sites decreased from 14 to 6 and Fibromyalgia impact Questionnaire score decreased from 82 to 23 after four treatments. Case-2 Received a combination of Laser Shower (8 Tx over 5wks) and Pain Away (self-treated) 3 consecutive days. Pain level was 0/10 after third home treatment. Case-3 Self-treated daily with TQ-Solo. Initial pain 8/10 decreased to 0/10 after 4 treatments. Conclusion: LLLT is a viable non-pharmacological treatment for FS. Self-treatment is effective in decreasing pain and increasing function.

**Francisco Gonzalez-Lima, PhD**

### ***Stimulation of Cognitive Brain Functions with Transcranial Near-Infrared Lasers and LEDs***

Near-infrared lasers and LEDs modulate mitochondrial respiration by donating photons to cytochrome oxidase, the main acceptor of photons from red-to-near-infrared light in neurons. Stimulation of cytochrome oxidase activity improves brain functions. Light that intersects with the absorption spectrum of cytochrome oxidase enhanced in vivo oxygen consumption (measured with fluorescence-quenching oxygen probe and near-infrared spectroscopy) and ex vivo cytochrome oxidase (measured with enzyme spectrophotometry and histochemistry) in both rat and human cerebral cortex. In rats, red-to-near-infrared light stimulation after fear extinction learning prevented fear renewal as compared to controls. In humans, transcranial infrared laser stimulation to the forehead improved prefrontal cortex-related cognitive and emotional

functions, such as sustained attention and working memory. These studies suggest that transcranial brain stimulation with red-to-near-infrared light may be used as an efficacious approach to increase neuronal mitochondrial respiration and improve cognitive functions. This fascinating approach provides a new non-invasive, neurocognitive-enhancing intervention in animals and humans.

**Sturla Haslerud**

### ***The Efficacy of Low-Level Laser Therapy in Shoulder Tendinopathy: A Systematic Review and Meta-Analysis of Effects***

Several randomized controlled trials investigating the effect of low-level laser on shoulder tendinopathy has been published. To support physical therapists in clinical treatment situations and comply with the requirement of working evidence-based, a systematic review and meta-analysis investigating the effect of low energy laser on shoulder tendinopathy was performed. Our findings challenge the conclusion in previous multimodal shoulder reviews, and their lack of intervention quality assessment.

**Aya Hoshikawa Hirai**

### ***Laser Therapy Modulates the Systemic Inflammatory Process in an Experimental Model of Sepsis in Rats***

Sepsis is a medical condition characterized by deregulated systemic inflammatory responses caused by a severe infection that decreases muscle force and skeletal muscle wasting. The aim of this study was to determine the laser therapy (LLLT) effectiveness on modulation of systemic inflammatory process and skeletal muscle morphology in experimental sepsis model. Seventy-two rats were divided into 3 groups: control group (CG); sepsis group (SG): rats submitted to CLP without LLLT; sepsis laser treated group (SLG). Animals were sacrificed at 6, 24, 48 and 72 hours post-surgery. Laser irradiation (GaAlAs, 808 nm, 30 mW, 48 s, 30 J/cm<sup>2</sup>; 0.028 cm<sup>2</sup> 1.7 mW/cm<sup>2</sup>) was performed immediately after surgery and every 24 hours. Results showed no modification in muscle fiber cross-sectional area in all groups. The results showed that LLLT was able to modulate inflammatory cytokine IL-6 and IL-10 at sepsis' early stage.

# Summaries CONTINUED

**Ronald E. Hirschberg DVM**

## ***LLLT in Veterinary Practice: Clinical Applications, Finances, Evidence Based Medicine...How it all Fits Together***

The questions on the mind of most veterinary practitioners when contemplating adopting LLLT into their practice are: When and how do I use it? Can I afford it? Is it evidenced based? In this presentation we will briefly look at the response to each of these inquires. The speaker will include several case studies which span the most common applications of light therapy in practice as well as several novel uses. The fiscal aspects of LLLT in veterinary practice are broad based. Client acceptance, return on investment and marketing considerations will be discussed in the course of the presentation. Finally the commonly used “excuse” for not adding LLLT to practice, namely the non adherence to evidence based medicine will be debunked. Questions will be addressed throughout the presentation in an effort to provide the most useful information to the participants.

**Nicolette Houreld**

## ***Gene Expression in Wounded and Diabetic Wounded Cell Models in Response to Irradiation at 660 nm***

Wound healing is altered in diabetes and leads to chronic ulcers. Lasers have stimulated impaired wound healing and influenced a number of cellular processes. This study determined the gene expression profile of genes involved in wound healing in response to irradiation. Wounded and diabetic wounded fibroblast cells were irradiated with a continuous wave diode laser (660 nm; 100 mW; 9.1 cm<sup>2</sup>; 11 mW/cm<sup>2</sup>; 5 J/cm<sup>2</sup>; 7 min 35 s). Total RNA was extracted 48 h post-irradiation and reverse transcribed. Real-time qualitative polymerase chain reaction (qPCR) was performed on the SABiosciences RT<sup>2</sup> Human Wound Healing Profiler PCR Array System. Different expression profiles were seen in the two models, with more genes being down-regulated in diabetic wounded cells than normal cells. Irradiation of wounded cells *in vitro* modulates the expression of genes related to wound healing, which leads to further downstream effects. Irradiation also results in dissimilar gene profiles in different cell models.

**Ilko K. Ilev, PhD**

## ***Impact of Critical Laser and Optical Radiation Characteristics on the Efficacy of Light-Tissue Interactions in Novel Therapeutic Technologies and Medical Devices***

The field of laser/light therapy when optical emission in the visible and near-infrared spectral range produced by coherent (lasers) or incoherent (light-emitting diodes or broad-band light) light sources is employed in various therapeutic applications such as reducing pain and inflammation, treating healing-resistant wounds, stimulating nerve and neuron growth, and promoting tissue regeneration, has been extensively investigated over the last several decades. However, despite many positive reports of animal models and clinical results, the efficacy of laser therapy remains controversial because fundamental light-cell/tissue interaction mechanisms are still not completely understood for specific therapeutic indications for use. Moreover, the efficacy of laser therapy is a multivariable characteristic depending on critical parameters of both laser source (radiation dose, wavelength, timescale and beam characteristics) and tissue (absorption, scattering and penetration depth). This presentation aims to discuss the impact of these critical parameters on the efficacy of novel optical therapeutic technologies and medical devices.

**Ann Kobiela Ketz, MN**

## ***Establishment of an Effective Photobiomodulation Treatment Protocol in an Animal Model of Persistent Neuropathic Pain***

The aim of this study was to establish an effective photobiomodulation treatment regimen in a neuropathic pain model and characterize the activation of macrophages/microglia along a pain pathway. The Spared Nerve Injury model was performed on adult male Sprague-Dawley rats, and mechanical allodynia was assessed with an electronic Von Frey device. The photobiomodulation parameters used decreased sensitivity to mechanical stimulation in this persistent neuropathic pain model. Immunohistochemistry and gene expression were used to characterize macrophage/microglial activation and response to PBM.

*Disclaimer: This research is sponsored by the TriService Nursing Research Program (Grant HT9404-13-1-TS09), however, the information or content and conclusions do not necessarily rep-*



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**Imran Khan, PhD**

***ATF-4 Mediates Near-Infrared Laser Phototoxicity***

High power lasers are used extensively in medicine while lower power applications are popular for optical imaging, optogenetics, skin rejuvenation and a therapeutic modality termed photobiomodulation (PBM). This study addresses the therapeutic dose limits and biological safety of near-infrared laser. Increased erythema and tissue damage were noted in mice skin and cytotoxicity in cell cultures at phototoxic laser doses involving generation of reactive oxygen species (ROS) coupled with a rise in surface temperature (> 45 °C). Laser phototoxicity results from Activating Transcription Factor-4 (ATF-4) mediated endoplasmic reticulum stress and autophagy. Neutralization of heat and ROS or overexpressing ATF-4 were noted to rescue laser phototoxicity. Further, laser mediated phototoxicity was noted to be non-genotoxic and non-mutagenic. This study outlines the mechanism of phototoxicity and the utility of monitoring surface temperature and ATF4 expression as biomarkers for safe and effective clinical applications with near-infrared lasers.

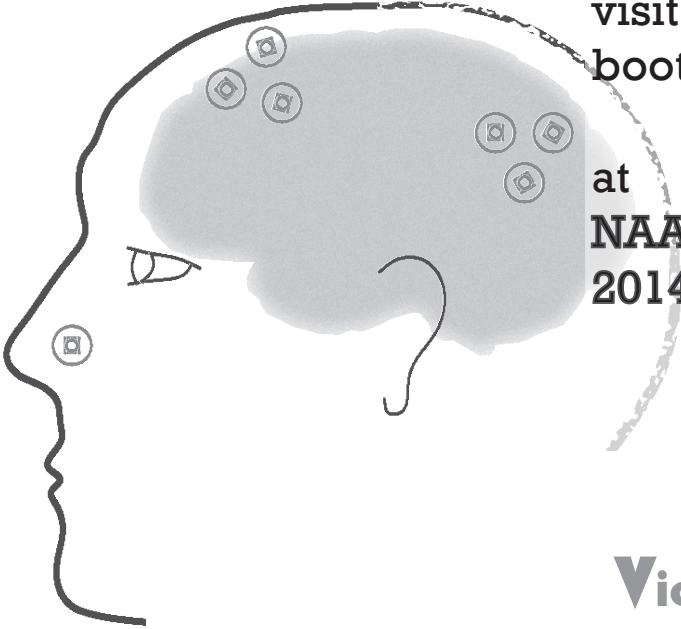
**Ann Liebert, PhD candidate**

***Protein Conformational Modulation by Photons: A Mechanism for Laser Treatment Effects***

LLLT at 450- 910nm is an established treatment for many conditions (pain, inflammation) however its underlying mechanisms are still unclear. Using recent research we propose an integrated model of LLLT action, based on the argument that laser photons modulate the nervous system through protein-



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to-protein interaction. We propose that the targeted action of laser on photoreceptors in the mitochondria induces modification of diverse targets by SUMOylation. When laser is applied, SUMOylation processes will influence the transmission of neural information via rapid modulation of ion channels (including K2P). Laser also has an indirect effect on enzymes such as tyrosine hydrolase, tyrosine kinases and tyrosine kinase receptors. External photons are proposed to tap into an existing photonic biomodulation mechanism, which modulates ion channels to act as signal integrators from the periphery to the cortex. These effects could contribute to the abscopal, bystander and other systemic effects that are observed with LLLT.

**Nicole L. Lohr, MD PhD**

### *Endothelial Dependent Vasodilation of the Microvasculature with 670 nm Energy*

Cardiovascular risk factors reduce NOS expression and NO production. Previous experiments identified 670 nm (R/NIR) energy increases NO independent of NOS. We hypothesized R/NIR can stimulate vasodilation and improve endothelial function. Facial arterioles from mice and human coronary arterioles from patients with and without atherosclerosis were pressurized and irradiated with 670 nm energy. In mice, vessel diameter significantly increased after R/NIR exposure, however this dilation was abolished when vessels were denuded prior to R/NIR dilation. The NOS inhibitor L-NAME did not attenuate dilation, however c-PTIO (100 $\mu$ M) could inhibit dilation. R/NIR significantly increased dilation in coronary arterioles from patients with and without atherosclerosis. Therefore, R/NIR can stimulate vasodilation in human and murine vessels in an endothelial and NO dependent manner, but does not require functional nitric oxide synthase. The exact source for the NO increase is unknown, but intracellular nitrosyl heme moieties should be considered as a source for NO.

**Rodrigo Alvaro B. Lopes-Martins**

### *Low Level Laser Therapy on Experimental Walker 256 Tumour - Friend or Foe*

The use of Laser Light in Cancer situations still a controversy. Except in PDT that is considered as a new minimally invasive therapeutic modality for the treatment localized and selective destruction of various types of cancers and malignant disor-

ders, laser light has been a reason for much discussion in such cases. The Main objective of this study was to evaluate the effects of Low Level Laser Therapy on an experimental model of WALKER 256 Tumour and the inflammatory processes interfering with development of tumor progression. Thus investigate the regulation and expression of inflammatory mediators COX-1 and COX - 2 by RT-PCR, the production of prostanoids, cytokines and Nitric Oxide. Our results demonstrate new and surprising results that may open a new avenue for laser research.

**Jeri-Anne Lyons, PhD, Associate Professor**

### *Induction of Regulatory T cells by 670nm Light in a Model of Autoimmunity*

Multiple sclerosis (MS) is an inflammatory demyelinating disease of the central nervous system. While early disease is due to autoimmunity, disease progression is due to increased oxidative stress and death of the axon. A role of protective regulatory T cells in preventing disease is recently recognized. Experimental Autoimmune Encephalomyelitis (EAE) is the primary animal model for MS, sharing clinical and histopathologic similarities with MS. Previous data from our lab demonstrated the therapeutic efficacy Low Level Light Therapy (LLLT) with 670nm light in the amelioration of EAE through down-regulation of pro-inflammatory mediators, up-regulation of anti-inflammatory cytokines, and protection of CNS cells from apoptotic cell death. Data will be presented that demonstrates the induction of protective regulatory T cells by 670 nm light. These cells are expected to play a direct role in the protection against clinical disease afforded by 670 nm light.

**Angela Magri**

### *Low Level Laser Therapy and Bone Healing in Diabetic Rats: A Biological Evaluation Using an Experimental Model of Tibial Bone Defect In Rats*

Diabetes mellitus leads to a delay in bone healing. Thus, some therapeutic approaches have been used to accelerate the process of bone repair such as low-level laser therapy (LLLT). The present study aimed to evaluate the effects of LLLT in bone repair in tibiae of diabetic rats. Sixty-four Wistar rats were divided in 4 groups: DCG, L30, L60 and L120. A 808 nm Ga-Al-As laser, 100 mW; 30 J/cm<sup>2</sup>, 60 J/cm<sup>2</sup> and 120 J/cm<sup>2</sup> was used.



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SUMMARIES

# Summaries *CONTINUED*

Histological, morphometric, immunohistochemistry and biomechanical analyses were performed. In the histological and morphometric evaluation, all laser treated groups showed a better histological pattern and a greater amount of new bone formation compared to DCG. An intense RUNX2 immunoreactivity was observed in the laser treated groups. RANKL immunohistochemistry analysis showed a significant decrease in the immunoreactivity in the groups L30 and L120. In conclusion, LLLT showed an osteogenic potential in bone healing of diabetic rats.

**Dr. Graham Merry MB, BS (Lond), LMCC**

## *Photobiomodulation in Age-Related Macular Degeneration Using Optical Coherence Tomography*

I will be presenting some exciting case reports of significant objective findings in patients with dry AMD following PBM therapy. This is the first time that the effect of PBM on drusen reduction in dry AMD has been reported. The findings were assessed by using state of the art Ocular Coherence Tomography prior and after PBM treatment.

**Eduardo Foschini Miranda, PhD**

## *Acute Effect of Phototherapy Combining Super-Pulsed Lasers and LEDs on the Isokinetic Performance (Strength and Muscular Endurance) in Patients With Chronic Obstructive Pulmonary Disease*

Phototherapy is an intervention being considered to retard the peripheral muscular fatigue in COPD. The objective was to evaluate the acute effect of phototherapy combining lasers and LEDs on the isokinetic performance in patients with COPD. Thirteen patients held muscular endurance test in isokinetic dynamometer, for determination of isometric force (FI), peak torque (PT) and total work (TW) of the non-dominant lower limb in two visits. The application of phototherapy combining lasers and LEDs or placebo (PL) was conducted of randomly in the femoral quadriceps muscle. We use a cluster of 12 diodes, being 4 diodes of 905 nm, 4 LEDs diodes of 875 nm and 4 LEDs diodes of 640 nm with a dose of 30 J, manufactured by Multi Radiance Medical. We found statistically significant for the increase of the PT ( $175 \pm 36$  vs  $156 \pm 23$  N;  $P = 0,003$ ) and

TT after application of the combination of lasers when compared with PL ( $778 \pm 221$  vs  $696 \pm 147$  N;  $P = 0,005$ ), the same finding was found for the FI ( $105 \pm 26$  vs  $87 \pm 23$  N,  $P = 0,000$ ). We can conclude that the combination of lasers and LEDs was able to increase isokinetic performance (strength and muscular endurance) and decrease the sensation of dyspnea and fatigue in the lower limbs in patients with COPD.

**Ingvill Fjell Naterstad, PhD Candidate**

## *Treating Tendinopathy with Low Level Laser Therapy*

Previous reviews have shown that Low Level Laser Therapy (LLLT) can reduce pain in subacute and chronic tendinopathy if a valid treatment procedure and location-specific dose is used. The aim of this systematic review and meta-analysis is to give an updated assessment of randomized placebo-controlled trials on the clinical effectiveness of LLLT in treating tendinopathies. Treatment parameters were evaluated by WALT dosage recommendations. Primary outcome measures were pain relief and/or global improvement. This systematic review and meta-analysis supports LLLT as an effective treatment for tendinopathies.

**Uri Oron, PhD**

## *Low-Level Laser Therapy to the Bone Marrow (Induction of Stem Cells) Reduces Scarring Post Myocardial Infarction in the Pig and Has Beneficial Effect on the Ischemic Kidney*

Low level laser therapy (LLLT) has been found to modulate various biological processes including enhancement of regeneration. The aim of the study was to demonstrate that LLLT application to the stem cells in bone marrow can induce endogenous mesenchymal stem cells and have beneficial effects on the ischemic pig heart following myocardial infarction (MI) and the ischemic rat kidney.

MI was induced in farm pigs by percutaneously balloon inflation placed in the left anterior descending coronary artery. Laser was applied to the tibia and iliac bones (non-invasive to the bone) 30 min, 2 and 7 days post-induction of MI for a duration of 100 sec. Ischemia was also induced to the rat kidney. Laser therapy to the bone marrow caused a significant improvement in kidney function.



LLLT application to BM in pigs cause significant reduction in scarring post MI and enhanced angiogenesis most probably by laser induced stem cells that are recruited to the infarcted area via the circulating blood. The results demonstrate a novel cell base therapy approach to reduce reperfusion injury in preclinical model of MI and ischemic injury to the kidney by endogenous cell therapy.

### **Shimon Rochkind, MD, PhD**

#### ***Dynamic Changes of Acetylcholine Receptors (AChR) and Creatine Kinase (CK) Activity in Complete Denervated Muscle and Protective Effect of Laser Phototherapy***

Post-traumatic prevention of muscle atrophy is a major challenge in restorative medicine. This study was designed to assess the status of skeletal muscles during long-term denervation processes, by investigating changes in AChR level and CK activity in denervated gastrocnemius muscle; and to analyse the influence of low power laser irradiation. The study was conducted on 96 rats. Gastrocnemius muscle was denervated. Low power laser irradiation was delivered transcutaneously to the muscle. AChR and CK activity were measured 7, 14, 21, 30, 60, 120, and 210 days after surgery. After 4 months for AChR and 2 months for CK content we found partial preservation in both components until 7 months after complete muscle denervation. Laser treatment had a significant therapeutic effect on the denervated muscle during the first 21 days for AChR and the first 30 days for CK activity. Conclusions: The survival of denervated muscle is longer than previously considered. In the early stages of muscle atrophy, laser phototherapy may preserve the denervated muscle.

### **Patrícia Gabrielli Vassão, Master Degree**

#### ***Effects of Low Level Laser Therapy (808 nm) on Muscle Performance in Elderly Women***

The aging process involves a series of physiological modifications in the musculoskeletal function. The low-level laser therapy (LLLT) has demonstrated positive results in muscle increase performance. The experimental was crossover randomized placebo-controlled procedures were composed by two sessions of fatigue protocol in isokinetic dynamometry and nineteen healthy women, between 60-70 years old. A AsGaAl laser (808

nm, 100 mW, 250 J/cm<sup>2</sup>, 892J/cm<sup>2</sup>, 8 point), was used on the rectus femoris muscle before the protocol. The results showed there was no influence of placebo or active LLLT order of application between groups. Also, no significant difference in the slope comparing placebo and active LLLT groups in fatigue index ( $p=0,723$ ) and peak torque ( $p=0,824$ ), although the active LLLT showed smaller index fatigue and higher peak torque in relation placebo LLLT. In conclusion, the LLLT could be related to the delay in skeletal muscle fatigue observed after the fatigue protocol in elderly women.







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