2016 GLAO/MASO Annual Session –

GLAO B. Holly Broadbent, Sr. Memorial Lecture

Date: Saturday, Sept 24, 2016, 10:00am - Noon

Speaker: W. Eugene Roberts DDS, PhD – Indianapolis, IN

Title: **Biomechanics:** ***Opening the Biologic Black Box***

Synopsis:

Advanced bioengineering in clinical practice helps control PDL stress for determinate force systems, anchored with extra-alveolar bone screws. This method achieves more efficient orthodontic and dentofacial orthopedic correction of even severe skeletal malocclusions, with minimal risk of root resorption. Biomechanics in orthodontics has evolved from static analysis of force systems to an integrated concept of the physiologic responses to a therapeutic load, superimposed on function. Experiments with genetically defined strains and knockout mice demonstrated that PDL stress >8-10 kPa results in cell necrosis, undermining resorption and a greater incidence of root resorption. The level of stress for tissue damage is less than capillary blood pressure (16kPa), because of the direct mechanical effects on cells and inflammatory mediators. Current objectives for efficient clinical management are a diagnosis that defines the etiology of a malocclusion, a treatment plan that reverses the etiology, and mechanics that consistently maintain PDL stress below 8kPa. Finite element iterations based on cone-beam CT data provide reliable treatment simulations, and also estimate the levels of PDL stress. Extra-alveolar (E-A) bone screw anchorage, differential enamel stripping, and corridor preparation for recovering severe impactions help control PDL stress during alignment. En masse movement of entire arches, relative to the center of resistance of supporting bone, has resulted in high quality, conservative (no extractions or orthognathic surgery) correction of severe skeletal malocclusions, with very low PDL stress (<5kPa). These new concepts for efficient management of severe skeletal and/or dental malocclusions will be illustrated with multiple case reports.

Course Objectives:

1) Provide a concise review of advanced bioengineering concepts that are expanding the therapeutic envelop of orthodontics and dentofacial orthopedics.
2) Explain the advantages of extra-alveolar bone screw anchorage for the conservative management of severe skeletal malocclusions, without extractions or orthognathic surgery.
3) Explain determinate mechanics for management of PDL stress to achieve maximal rates of tooth movement and orthopedic correction with minimal risk of root resorption.

Narrative Biography:

University education was a DDS at Creighton University, PhD in Anatomy at the University of Utah, and Certificate in Orthodontics at the University of Connecticut. Dr. Roberts serves as Professor Emeritus of Orthodontics and Adjunct Professor of Mechanical Engineering at Indiana University & Purdue University, and also as Visiting Professor of Orthodontics at Loma Linda University. His affiliations include ABO Certification, Midwest Component of the Angle Society, Board of Directors GLAO, and Director AAOF. Among his honors are *Docteur Honoris Causa* (Medicine) University of Lille (France), US Navy Commendation Medal with Combat V, AAO Jarabak Award for Orthodontic Education & Research, AAO Salzmann Lecture, ABO Dale Wade Award for Excellence in Orthodontics, and the Albert H. Ketcham Award (ABO).