**Presentation:** Rapid Fire, Thursday Nov 8\textsuperscript{th}, 15.00-16.00, Room 217 A-B  

**Title:** Celebrating 20 years of silicone hydrogels: the past, present and future  

**Course description:** Using the analogy of a child growing up, four presenters cover the twenty-year timeline of silicone hydrogels (SiHys). How does the historical performance of this material inform both currently available lenses and future applications? Each part of the talk covers a specific period in the timeline since 1998: from infancy, through to elementary and high school years, balancing properties for comfortable daily wear and gaining increased understanding of interactions with the ocular surface and tear film. At age 20, SiHys have yet to graduate from college, leaving the last talk to share what the future may hold.  

**Presenters:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lyndon Jones</strong></td>
<td>PhD FCOptom FAAO Professor, School of Optometry &amp; Vision Science and Director, Centre for Ocular Research and Education, University of Waterloo, Canada</td>
</tr>
<tr>
<td><strong>Jill Woods</strong></td>
<td>BSc MCOptom FAAO Clinical Research Manager and Senior Clinical Scientist, Centre for Ocular Research and Education, University of Waterloo, Canada</td>
</tr>
<tr>
<td><strong>Karen Walsh</strong></td>
<td>BSc (Hons) MCOptom PGDip Clinical Scientist, Centre for Ocular Research and Education, University of Waterloo, Canada</td>
</tr>
<tr>
<td><strong>Doerte Luensmann</strong></td>
<td>PhD Dipl. Ing. (AO) FAAO Clinical Scientist, Centre for Ocular Research and Education, University of Waterloo, Canada</td>
</tr>
</tbody>
</table>

**Learning objectives**

1. To understand how silicone hydrogel materials have changed over time in order to deliver a more optimum balance of properties for daily, rather than extended or continuous wear  
2. To understand the interactions of silicone hydrogel with the ocular surface and tear film, and to be able to better advise patients on suitable silicone hydrogel material, design and modality choices.  
3. To gain an understanding of the potential future uses and limitations of silicone hydrogel material technology.  

Centre for Ocular Research & Education (CORE) 2018.
Talk content

Talk 1
Presenter: Jill Woods

The need for more oxygen, the initial technology making SiHys possible and their performance on eye
- Brief historical perspective prior to silicone hydrogels, where frequent replacement soft hydrogel contact lenses were available, but hypoxia-related complications could be seen with full time daily and extended wearers.
- The potential of silicone was known, but significant technical challenges had to be overcome in order to incorporate a hydrophobic element into a contact lens
- How first generation silicone hydrogel materials were manufactured to address the issues of hydrophobicity – the surface treatments employed to make the surface wettable
- How the infancy of this technology, from 1998-2003, delivered both a leap forward in oxygen delivery and some initial physiological challenges. Hypoxic responses were significantly reduced, and for daily wear, eliminated. However, some mechanical complications arose from the increased modulus of these early materials.
- Mechanical complications of superior epithelial arcuate lesions (SEAL), contact lens induced papillary conjunctivitis, discomfort and mucin balls will be covered

Talk 2
Presenter: Karen Walsh

How the focus of the use of silicone hydrogel materials moved beyond continuous or extended wear to open eye daily wear, and how material properties were balanced to achieve broader use of the technology
- Timeline of material innovations and changes over this period, eventually resulting in availability of daily disposable silicone hydrogels
- The balance of material properties were addressed to achieve more comfortable daily wear.
- All silicone hydrogels released since 1998 have had a lower Dk/t
- Brief review of the oxygen needs of the eye in contact lens wear: Dk/t, oxygen flux, oxygen consumption. Law of diminishing returns.
- Balancing water content and modulus to increase comfort and reduce ocular complications
- Does the coefficient of friction of the material affect contact lens comfort?
- Contact lens complications still occur: microbial keratitis and corneal infiltrative events
- Daily disposable modality eliminates many of the risk factors for these complications
Talk 3
Presenter: Doerte Luensmann

Representing the 'high school years', 2010-2018 resulted in increased understanding of the interaction of this material with the tear film, ocular environment and care systems
- New material technology available – timeline of innovation
- What happens when a material interacts with a biological system
- How the tear film and contact lens interact with one another
- Detailed knowledge emerges of the interactions of silicone hydrogel materials with the tear film
- The deposition profile of tear proteins and lipids are established
- The importance of the conformational state of deposits from the tear film are explored
- What can we measure clinically, and how clinically relevant are the in vitro results?
- What else may affect contact lens comfort? Material and solution combinations? Inflammatory effect of contact lens wear?

Talk 4
Part 4: College / Timeline: 2018-
Presenter: Lyndon Jones

Finally, the ‘college years’ show a glimpse of the future as silicone hydrogels graduate and move into new and currently unavailable areas of technology.
- What does the future hold for this material family?
- What are the issues that still need to be addressed? For example, can comfort be improved still further, and can the rate of corneal inflammatory events and microbial keratitis be reduced through further material innovation?
- Sharing how not all new technology is possible on a silicone hydrogel platform. For example, it has not always proved possible to manufacture, or manufacture cost effectively, certain designs in silicone hydrogel.
- Can we expect to see myopia control designs or ‘smart’ contact lenses in silicone hydrogel materials?
- What are the challenges of drug eluting contact lens materials, and are those challenges more difficult with silicone hydrogels?
- What can biosensing technology likely be used for in future? Ocular and systemic applications
- What are some of the unique optical designs that are being explored?
- Happy 20th birthday SiHy CLs!