



**MICROSCOPY SOCIETY  
OF NORTHEASTERN  
OHIO, INC.**

An affiliate society of the  
Microscopy Society of  
America and the  
Microanalysis Society



**MSNO Winter MEETING**

**Wednesday, February 26th, 2014, 4:00 – 8:30 p.m.**

**Dittrick Medical History Center - Allen Memorial Medical Library**

**11000 Euclid Ave. Cleveland, OH 44106-1714**

Registration	4:00 – 5:30 PM	
Presentation 1		
<b>John Davidson</b> Dittrick Medical History Center	5:30 - 6:15 PM	<b>A Short History of Microscopy</b>
Dinner	6:15 - 7:15 PM	
Presentation 2		
<b>Dr. James M. Edmonson</b> Dittrick Medical History Center	7:15 – 8:00 PM	<b>The Medical and Scientific Collections of the Dittrick Medical History Center: an Overview</b>
Business Meeting	8:00 – 8:30	

Dinner will be \$20 for MSNO members, \$25 for non-members and \$5 for student members, \$10 for student non-members. Preregistration is available at <http://www.msneo.org/meetings.html>, or registration and payment at the door will also be available. Preregistration is required so we can get a good head count.

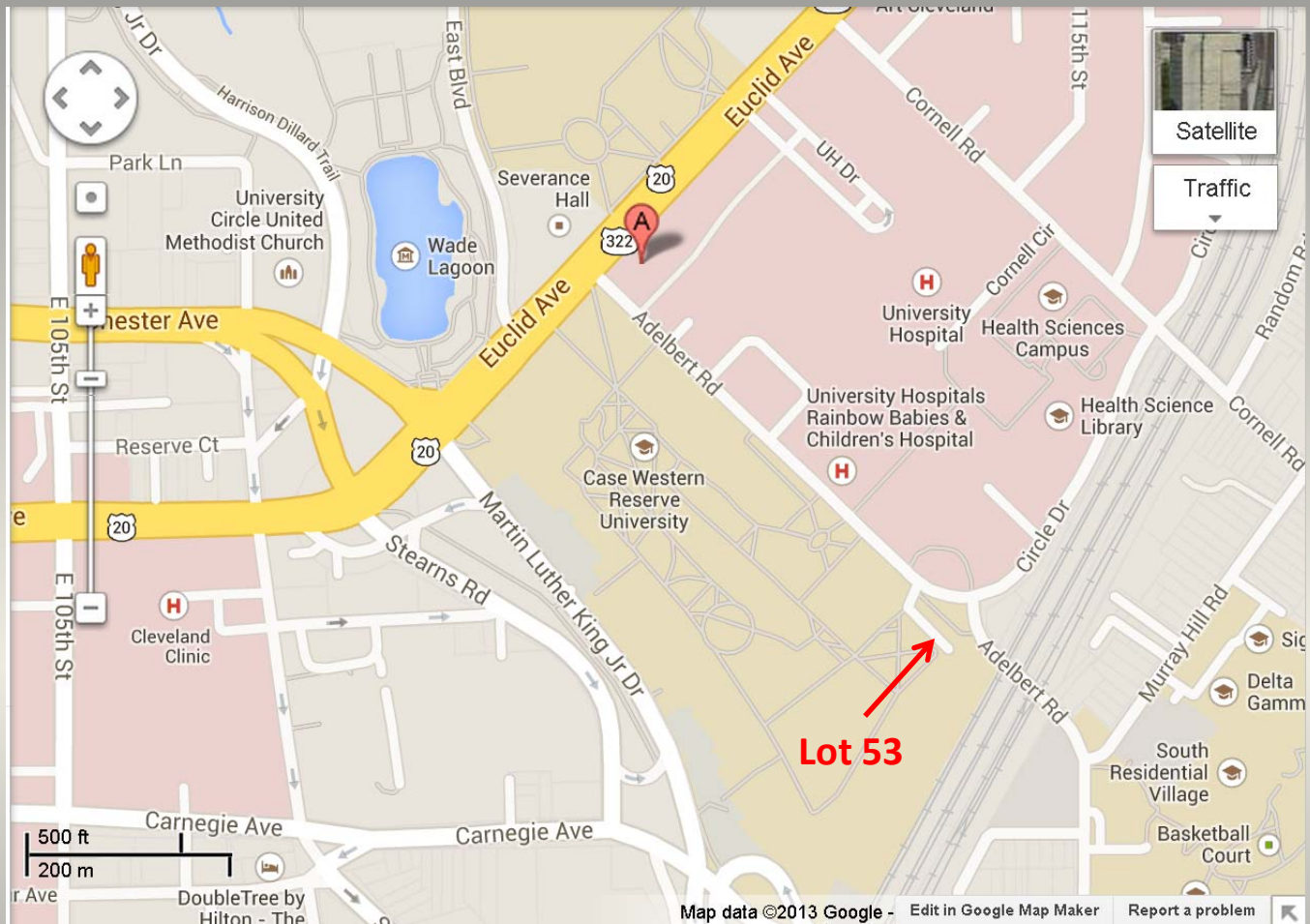
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## Map and Parking:

Case Western Reserve University Campus: Allen Memorial Medical Library,  
11000 Euclid Ave. Cleveland, OH 44106-1714

Please use parking lot 53



## Next Planned Meetings into 2014

**2014 May 21st** – Will be held at John Carroll University partnering with SAS/ACS/AVS. If you wish to give a talk, present a poster, or sponsor please contact Amir Avishai. ([Amir.Avishai@case.edu](mailto:Amir.Avishai@case.edu)).

**2014 Oct** – The meeting will take place at Akron University.

We would like to remind you to check our [LinkedIn web group \(MSNO\)](#) and **our new Facebook page:**

[http://www.linkedin.com/groups?gid=4635160&trk=my\\_groups-b-grp-v](http://www.linkedin.com/groups?gid=4635160&trk=my_groups-b-grp-v)

<https://www.facebook.com/MicroscopySociety>

Thank you,  
MSNO board

## John Davidson (Dittrick Medical History Center)

### A Short History of Microscopy, With Special Reference to the Instruments Exhibited at the Dittrick Museum

There exist in museum collections polished gems and glass artifacts dating from antiquity which could have served as magnifiers or low power simple microscopes and the use of transparent lenticular pieces as burning glasses is well established. The perhaps earliest literary reference is found in Aristophanes' 434BC comedy "The Clouds" Two suitably figured crystal pieces dating from 1200 to 1600 BC were found in Crete but whether they were used as lenses is unknown. There is a curious legend from 17th century India that suggests that gems were used as lenses on occasion.

Eye glasses made their appearance towards the end of the 13th century but no record of any other optical instruments exists prior to the end of the 16th century The microscope probably was invented between 1590 and 1609 in Holland with the Janssens, both father and son, considered the most likely originators No microscopes which can be reliably dated exist prior to about 1665. The telescope made its appearance in the same time period and place but perhaps a bit earlier than the microscope

In the 17th century two microscopists stand out, Leeuwenhoek and Hooke. Leewenhoek used simple microscopes and ground his own lenses with such skill that some of observations were not duplicated until achromatic objectives were perfected in the 19th century. Hook used a compound microscope and copy of his "Micrographia" of 1665 will be on display. This record of his observations created a sensation when published and the plates were reissued twice in the 18th century, the last being in 1780.

A method used in the 17th and early 18th century to make lenses for simple microscopes was to melt the ends of thin glass rods into spheres and to fix these between thin metal plates. A number of replicas of these easily made microscopes will be available for attendees to try out and the best of them will resolve about 5um.

At the end of the 17th century the compound microscope had a useful magnification of perhaps 100X and no real improvement followed until the first quarter of the 19th century and the development of achromatic objectives. However many mechanical improvements were made in microscope stands and there was a gradual replacement of wood and cardboard with more rigid and stable brass as the instruments on display will illustrate.

The first decades of the 19th century saw the development of achromatic objectives both in England and in continental Europe. A very important discovery was made in England by Goring, a physician, who was working with Tully on the achromatic objective problem. They discovered that some objectives could see more detail than others and this led directly to the use of test objects with periodic structure. At first insect scales were used and as better lenses were developed diatom frustules. In 1846 Nobert produced uniform ruled gratings on glass. The speaker feels that easily made two dimensional regular arrays of well characterized uniform latex spheres make a good substitute for the now unavailable ruled gratings. The other major discovery by Tully and Goring was the importance of objective angular aperture (NA), the higher the NA the greater potential resolution.

In 1830 Lister published his calculations as to how to space two plano-convex achromatic lenses to eliminate spherical aberration and construction of objectives gradually moved from trial and error to a science.

Microscope objectives in the 19th century were built by skilled craftsmen using only a simple foot powered lathe and hand held tools and how they managed to grind, polish, and mount the components of achromatic objectives holding tolerances of less than 0.001 inch is a real tribute to their skill.

The last quarter of the 19th century saw the development of oil immersion objectives in 1874 by the American optician Tolles and the marketing of apochromatic objectives by Zeiss (Jena) in 1886. By 1900 the optical microscope had reached a high degree of perfection and NA values had reached their theoretical limit as predicted by the Abbe theory of microscopic vision published in 1873. However this theory was strongly opposed by some and was still a matter for discussion up before the Royal Microscope Society in 1930.

Early in the 20th century Adam - Hilger Ltd. introduced the use of Michelson interferometers in the quality control and development of lenses including microscope objectives. It is worth noting that Zeiss (Jena) purchased a complete set of these instruments from Hilger Ltd. in 1929.

The early 1930s saw the development of the transmission electron microscope in Germany and by 1938 the first scanning transmission microscope

All of the above will be briefly covered in the presentation and there should be time to examine during the course of the meeting to examine the various displays of microscopes and related books on exhibit in the museum.