
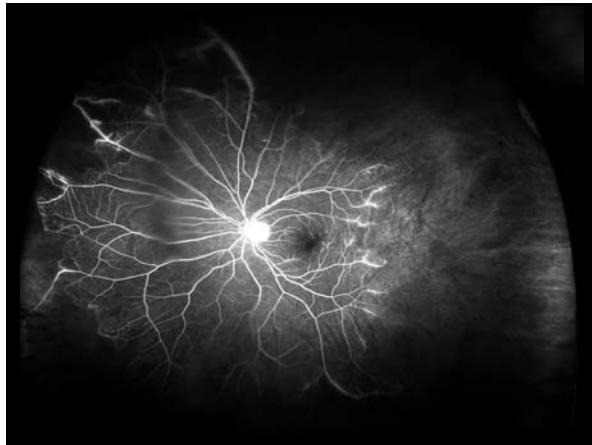
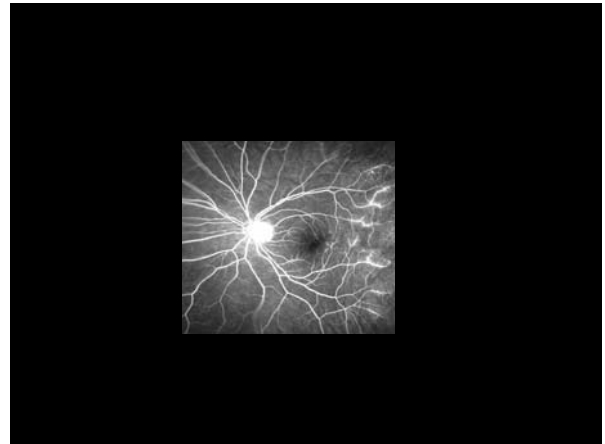


Wide Angle Imaging

Sarah Moyer, CRA, OCT-C
 Director, Ophthalmic Imaging
 Kittner Eye Center
 University of North Carolina
 Chapel Hill, NC

No financial interest.

Wide Angle Fundus Photography

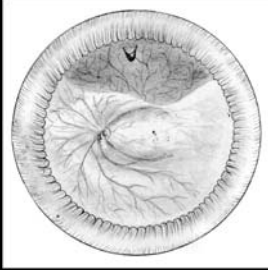
- Diabetic Retinopathy
- Peripheral Tumors
- ROP
- Coat's Disease
- Sickle Cell Retinopathy
- Central Retinal Vein Occlusion (CRVO)

Overview

- History
- Montages
- Commercially Available Systems
 - Heidelberg with Staurenghi Lens
 - Retcam
 - Optos

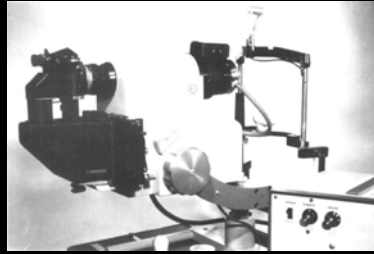
History of Wide Angle Fundus Photography

- Retinal Drawings
- Late 1800s- Jackman and Webster
 - Began photographing human retinas
- 1950s- Electronic flash and 35mm cameras
 - Adapted to ophthalmic instruments
- 1970s- First Wide Angle system
- 1990s- Digital camera backs
 - No more darkrooms!
- 2000s
 - Optos
 - Panoret
 - Staurenghi lens



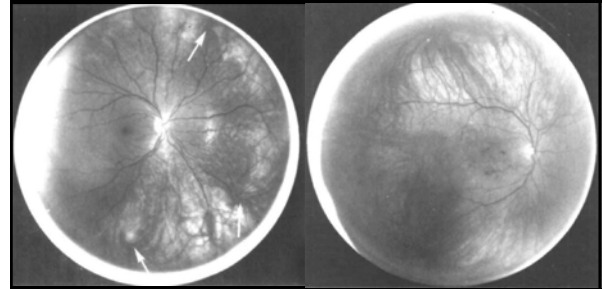
Scheffer A, Flynn HW. Pneumatic Retinopexy for Retinal Detachment After Macular Hole Surgery. Retinal Physician. January 2011.
 Bennett TJ, Barry CJ. Ophthalmic imaging today: ophthalmic photographer's viewpoint - a review. Clinical & Experimental Ophthalmology. 2009;37:2-13

Equator-Plus



- Traditional Fundus camera optically
- Transscleral Fiber Optic illumination
- Spring-loaded Contact Lens
- Calculated to exert a max pressure of 20mm Hg.
- Buzzer indicates if pressure is exceeded.
- 148 degree field of view

Pomerantzeff, Oleg. Equator-plus camera. *Investigative Ophthalmology*. May 1975; Vol 14, Num 5, pp 401-406.
Department of Ocular Pathology, City University School of Medical Education, Boston, MA

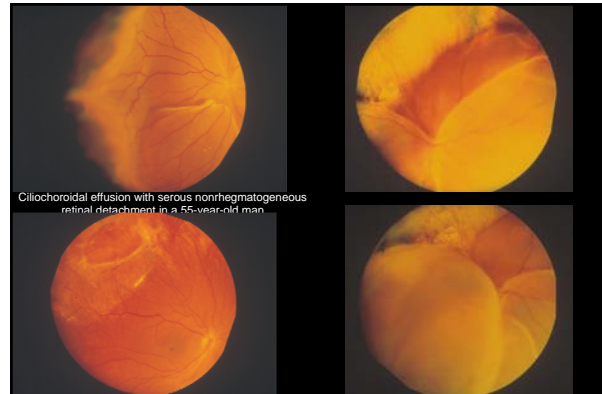


Pomerantzeff, Oleg. Equator-plus camera. *Investigative Ophthalmology*. May 1975; Vol 14, Num 5, pp 401-406.
Department of Ocular Pathology, City University School of Medical Education, Boston, MA

Panoret



- Medibell Medical Vision Technologies Ltd
- Early 2000s
- Named for capturing "panoramic" retinal images
- Handheld Fundus camera
- Transscleral Fiber Optic illumination
- 130 degree field of view

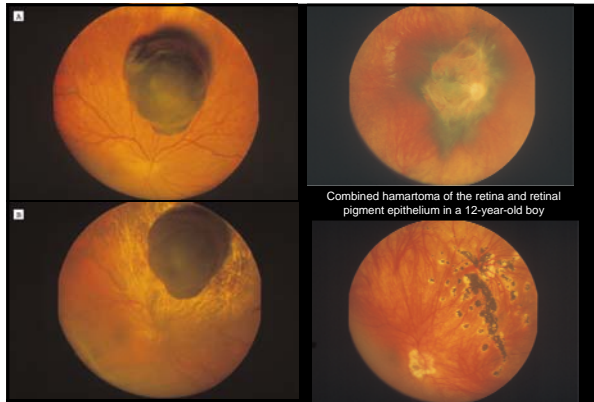


Ciliochoroidal effusion with serous nonrhegmatogenous retinal detachment in a 55-year-old man.

Macular hole and peripheral retinoschisis with an outer layer hole in a 36-year-old woman.

Choroidal metastases from breast cancer, with shifting subretinal fluid, in a 54-year-old woman.

Shields, C, et al. *Panoramic Imaging of the Ocular Fundus*. *Arch Ophthalmol*. 2003;121(11):1603-1607.



Mushroom-shaped choroidal melanoma in a 46-year-old woman.

Ocular histoplasmosis syndrome in a 47-year-old woman

Shields, C, et al. *Panoramic Imaging of the Ocular Fundus*. *Arch Ophthalmol*. 2003;121(11):1603-1607.

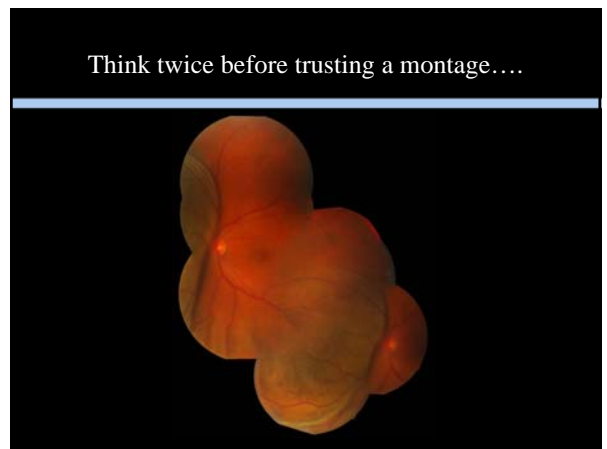
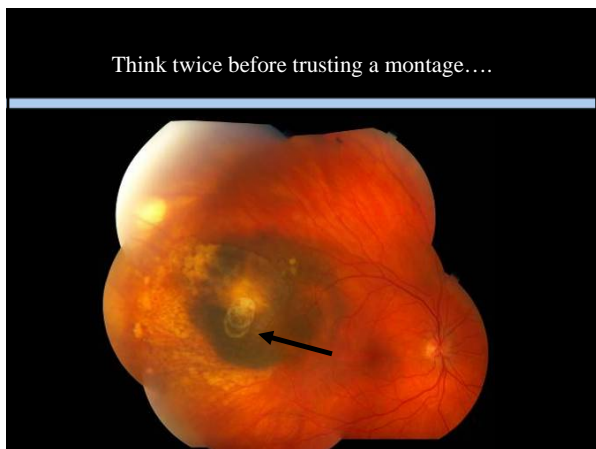
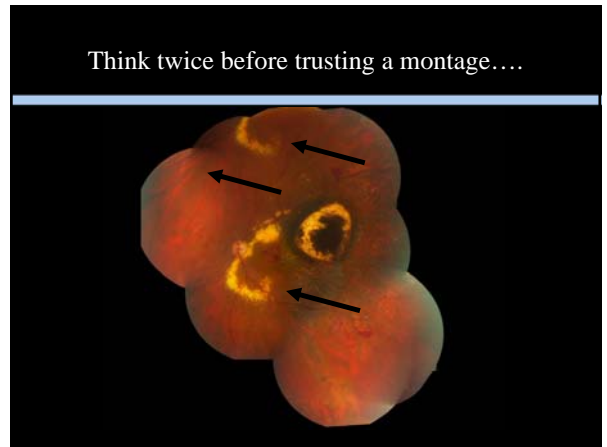
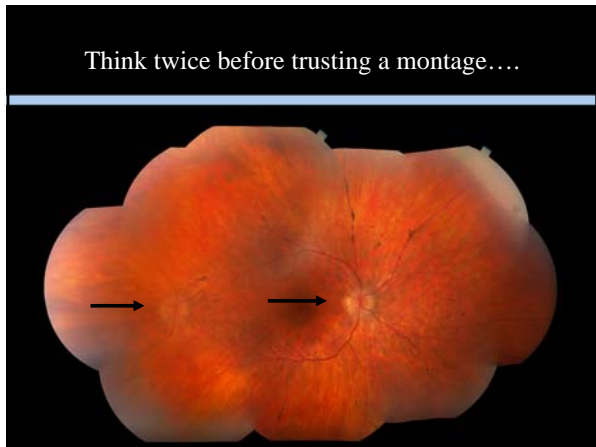
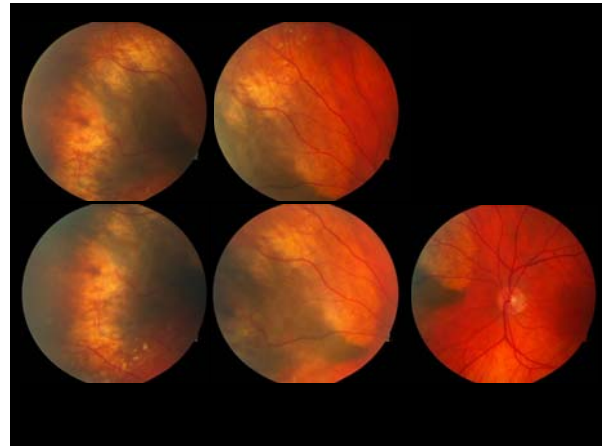
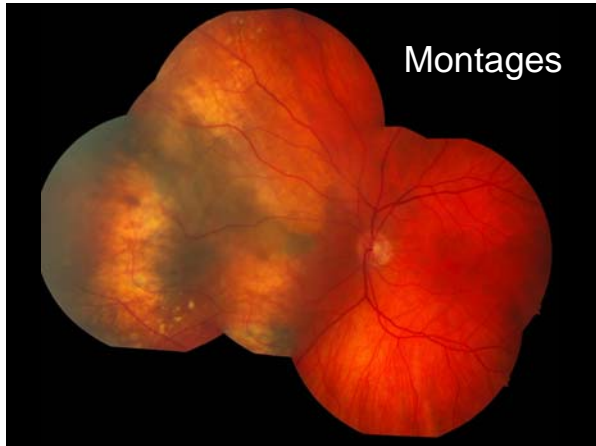
Panoret

Advantages

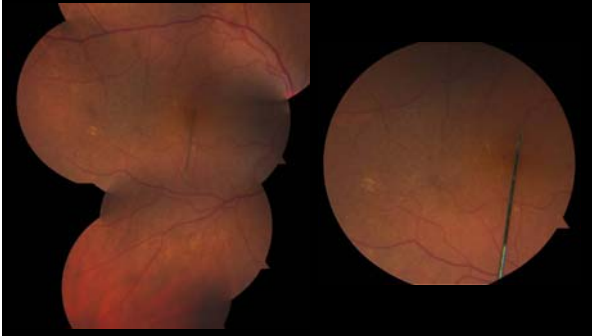
- Great with people of all ages
- Portable

Disadvantages

- Steep learning curve
- No longer commercially available



Think twice before trusting a montage....



Montages

Advantages

- Software modification of current system
- Easy to change eye
- Easy to learn technique

Disadvantages

- Time consuming
- Artifacts
- Hard to perfect technique

Heidelberg with Staurenghi Lens



- Additional lens used with Heidelberg HRA / Spectralis
- 2005
- Contact lens
- 150 degree field of view

Photo Courtesy of Ocular Instruments

Imaging Technique



Photo Courtesy of Amanda Bye

Lens Placement



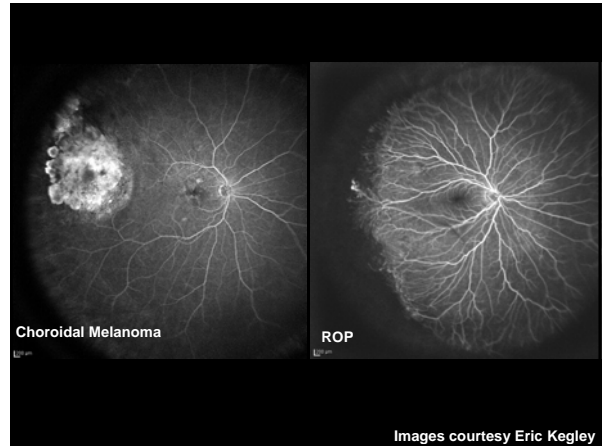
Photo Courtesy of Amanda Bye

After Acquisition

- Images are inverted and reversed just like an indirect ophthalmoscope.
- Heidelberg software has a button to invert the image back to "normal".



Photo Courtesy of Amanda Bye



NEW INSTRUMENT

Scanning Laser Ophthalmoscopy and Angiography With a Wide-Field Contact Lens System

Giovanni Staurenghi, MD; Francesco Viola, MD; Martin A. Mainster, PhD, MD; Raymond D. Graham, ASC; Peter G. Harrington, BSc

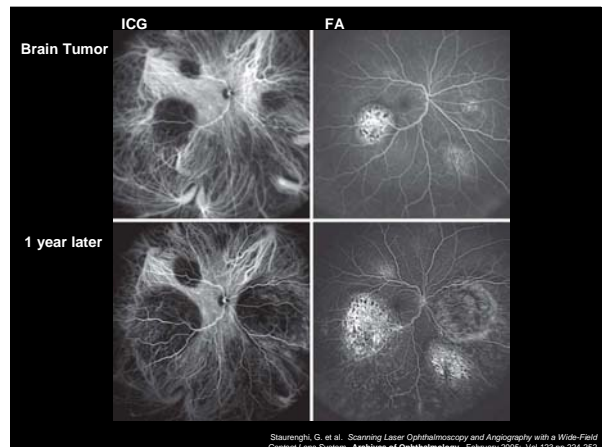
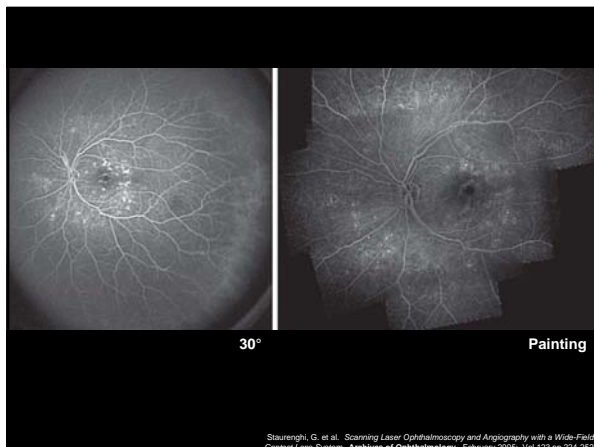
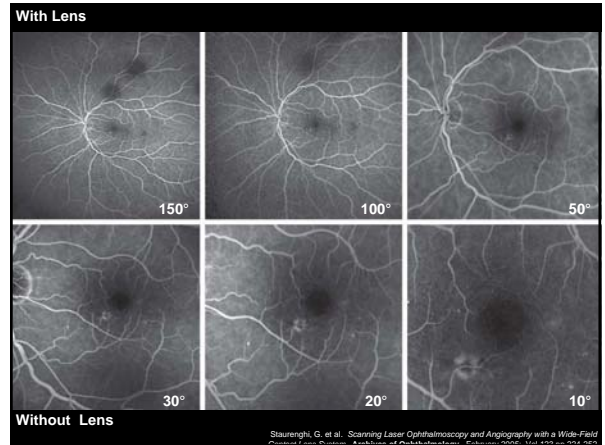
Objective: To perform fluorescein and indocyanine green angiography for large or peripheral chorioretinal structures using a contact lens system that provides a 5-fold increase in the field of view of a confocal scanning laser ophthalmoscope (SLO).

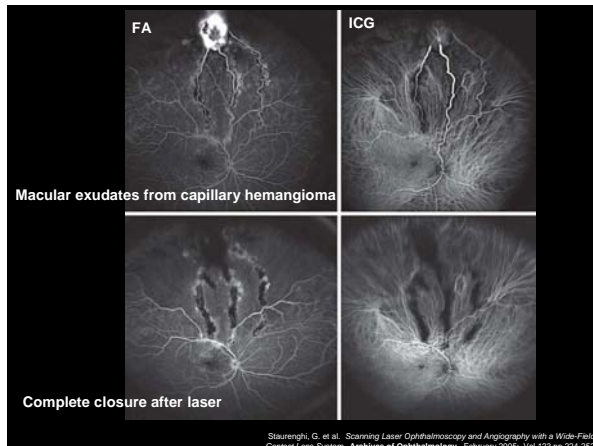
Methods: Separate handheld contact and noncontact ophthalmoscopic lenses were manually aligned with the optical axis of a confocal SLO to demonstrate the feasibility of wide-field SLO angiography. An integrated, wide-field contact lens system was then designed and constructed to increase the SLO's 10°, 20°, and 30° imaging fields to 30°, 100°, and 150°, respectively.

Results: Simultaneous fluorescein and indocyanine green angiography was performed with the integrated, wide-field contact lens system for more than 50 patients with disorders that affect their peripheral retina and choroid. Retinal and choroidal abnormalities, including neovascularization and capillary nonperfusion, are easily detected and documented well beyond the range of conventional fundus cameras and SLOs. Peripheral retinal and choroidal hemodynamics can be readily observed and recorded.

Conclusions: A confocal SLO has adequate resolution for clinically useful reflectance and angiographic imaging even when its field size is increased 5-fold by a wide-field contact lens system. Dynamic and static wide-field angiography can be performed without the limitations of manual or computer-automated photomontages. Peripheral retinal conditions can be studied and recorded to confirm observations from indirect ophthalmoscopy and to facilitate retinal photocoagulation and vitreoretinal surgery.

Arch Ophthalmol. 2005;123:244-252






Heidelberg with Staurenghi Lens

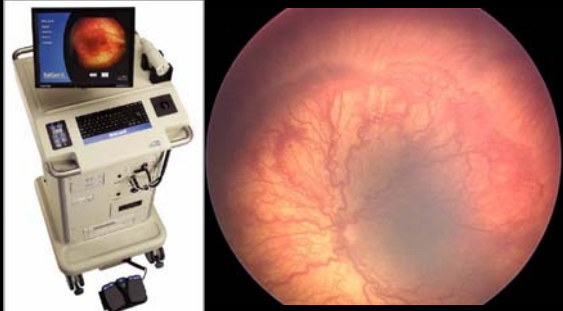
<p>Advantages</p> <ul style="list-style-type: none"> • Modification of current system • Can manipulate to get very far into periphery • Video of FA / ICG 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Difficult to switch between eyes • Possibility of corneal abrasion • Steep learning curve • Difficult for some patients to tolerate
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Retcam

<p>Advantages</p> <ul style="list-style-type: none"> • Designed for children • Portable • Can be used in operating room / incubator • Can get into far periphery • Video capability 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Steep learning curve • Low resolution • Possibility of corneal abrasion
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Clarity Retcam



Images courtesy of www.claritymsi.com/



Clarity Retcam

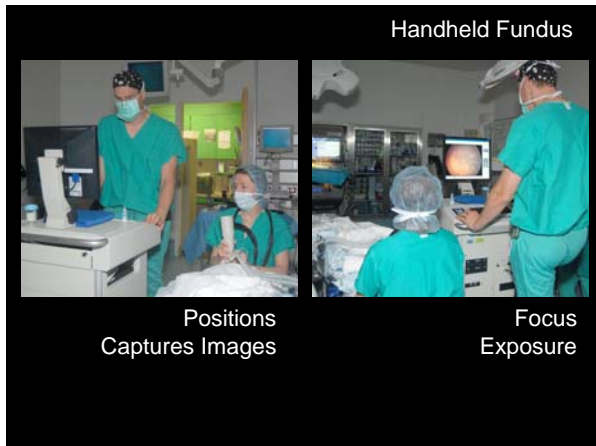


- Captures images with video.
- Transpupillary Fiber Optic illumination
- First system sold in 1997
- Portable
- 110 degree field of view

Images courtesy of www.claritymsi.com/

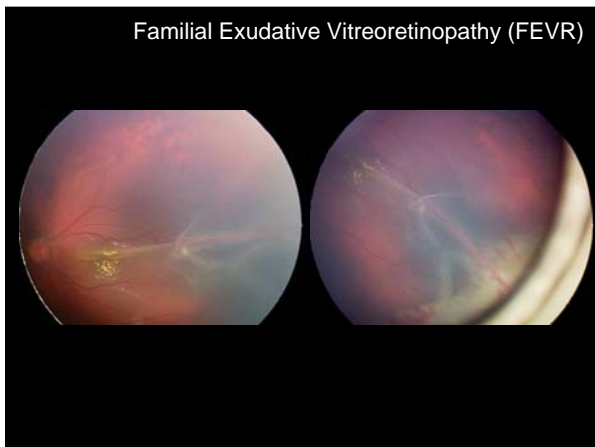
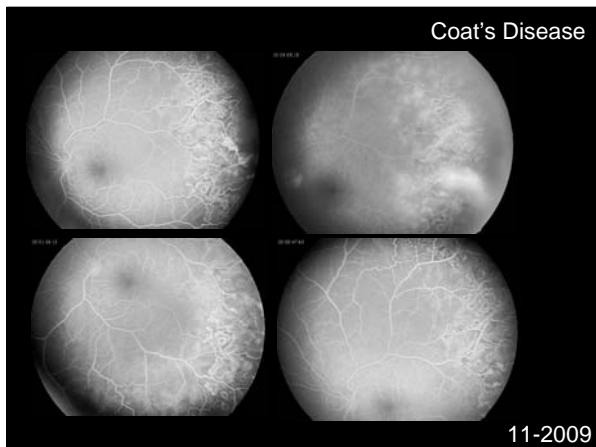
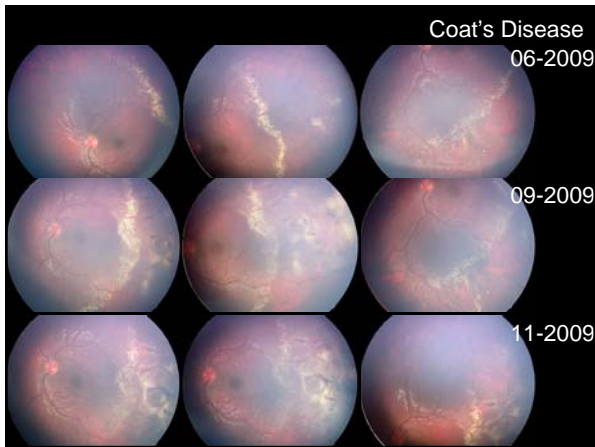
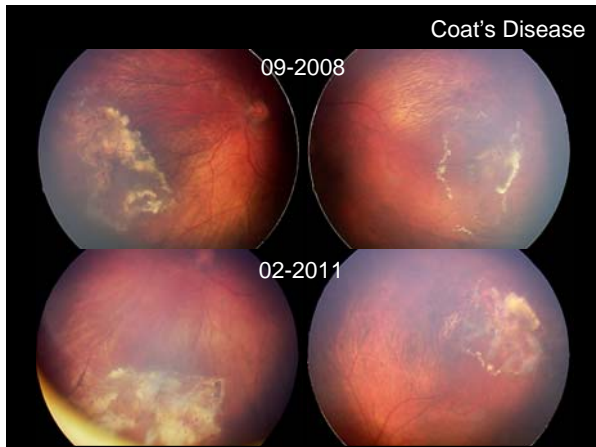
Handheld Fundus

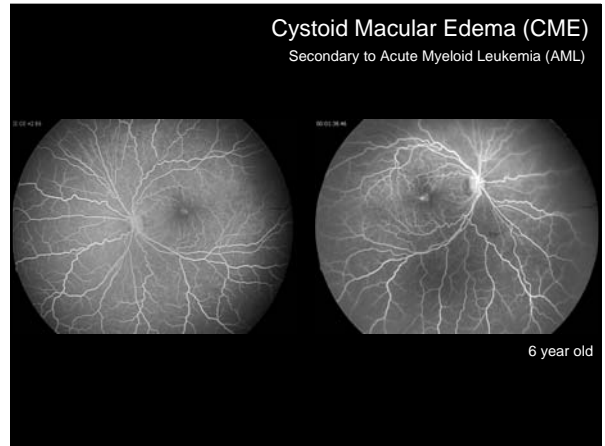
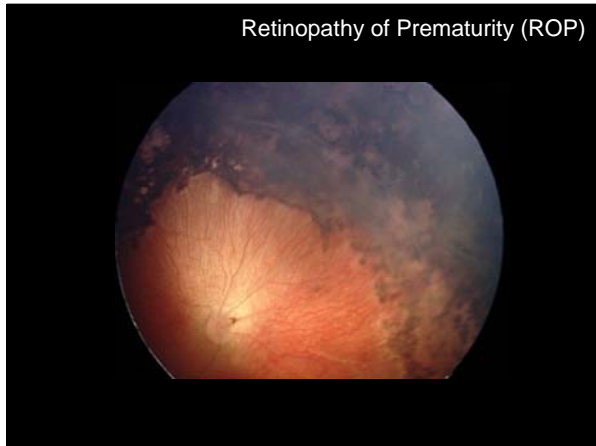
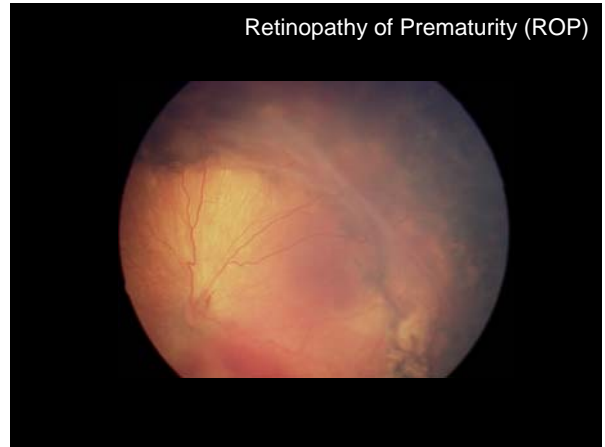
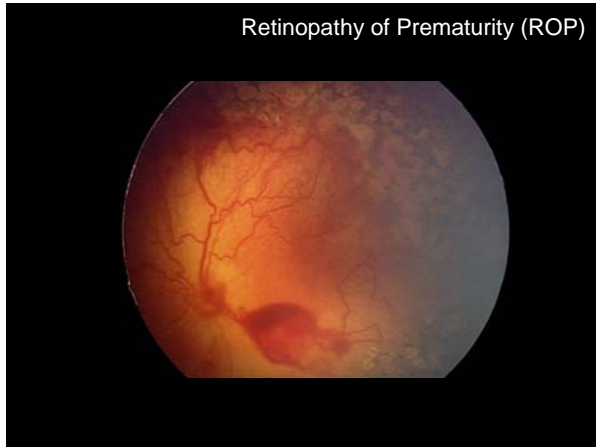
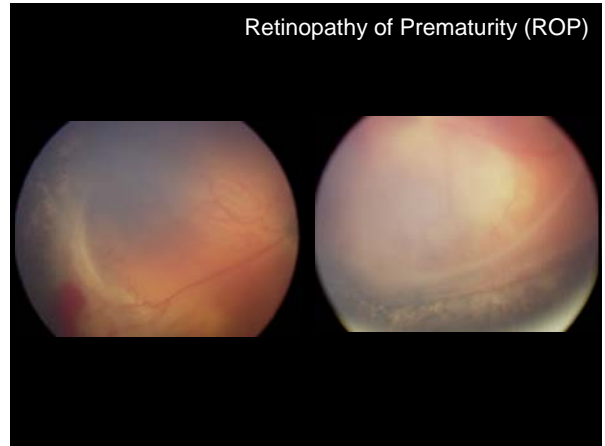
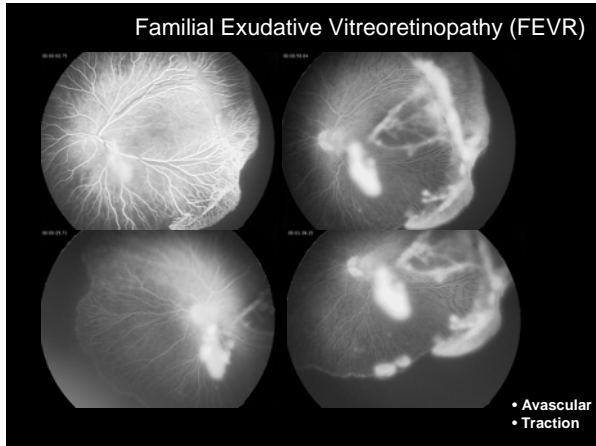
 <p>Lid Speculum</p>	 <p>Contact with gel</p>
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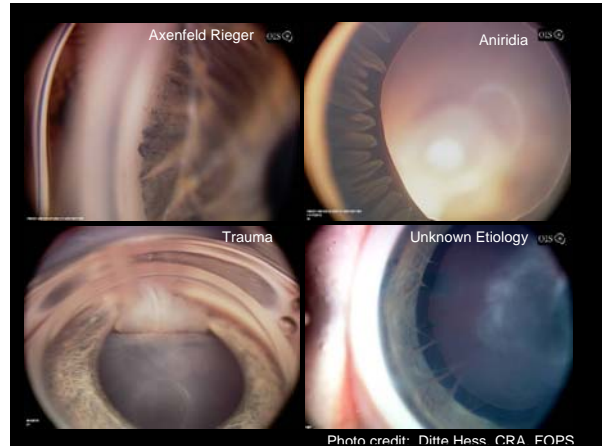
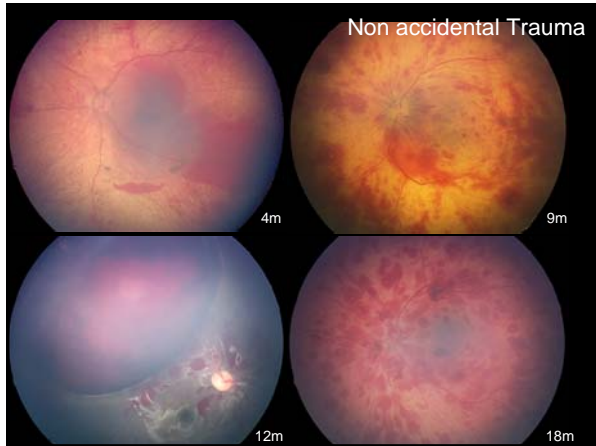


Pediatric Imaging

- Coat's Disease
- Familial Exudative Vitreoretinopathy (FEVR)
- Cystoid Macular Edema (CME)
- Retinopathy of Prematurity (ROP)
- Retinoblastoma
- Non accidental trauma
- Gonio imaging

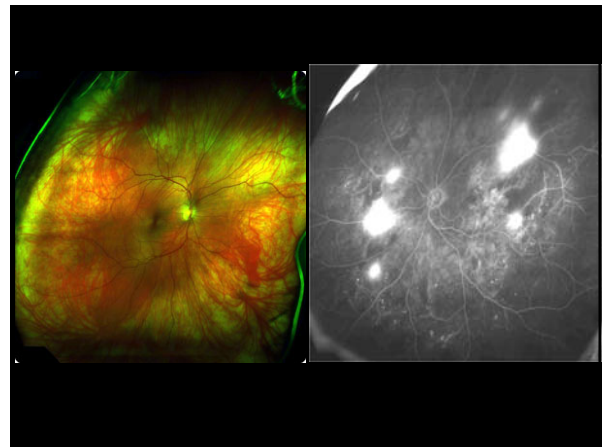


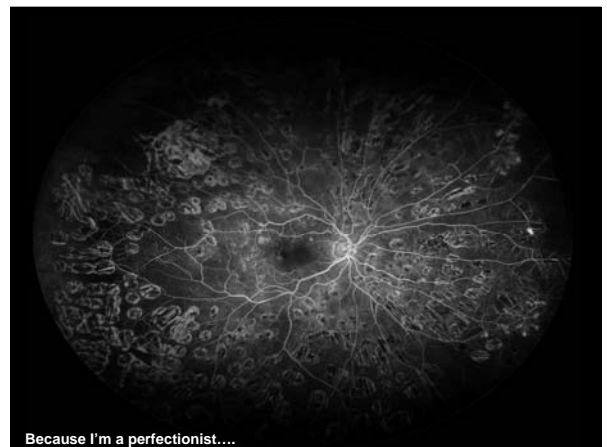
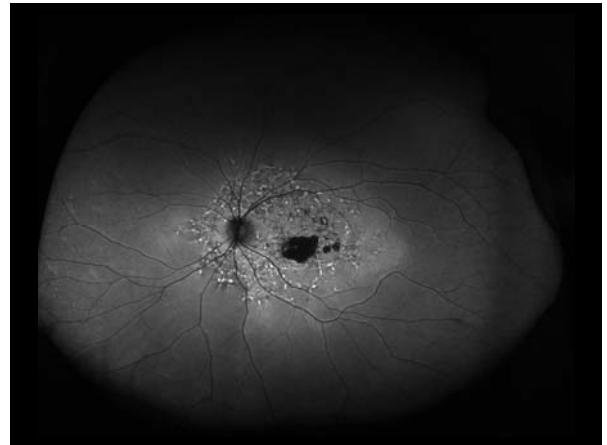
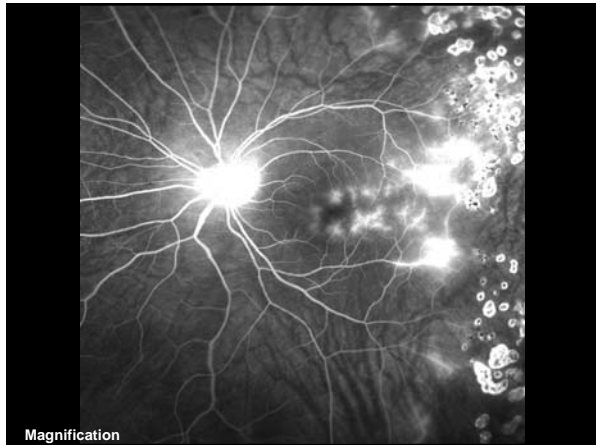
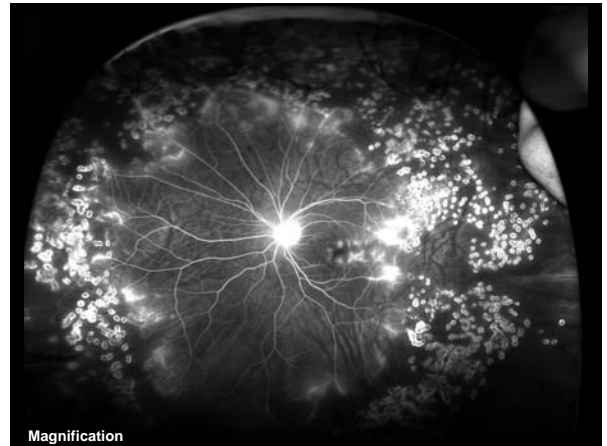


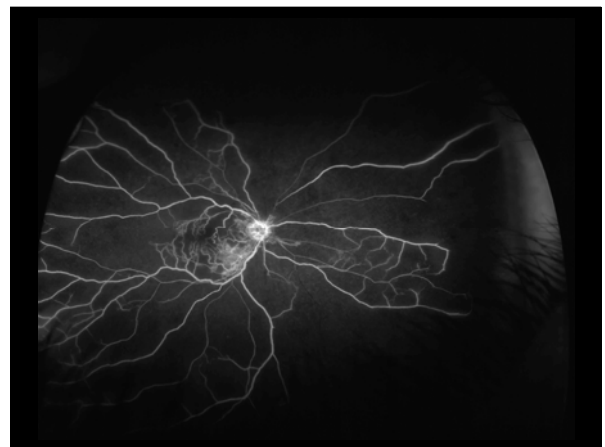
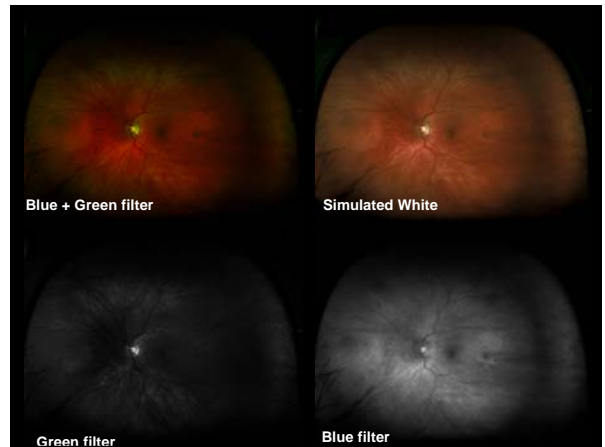
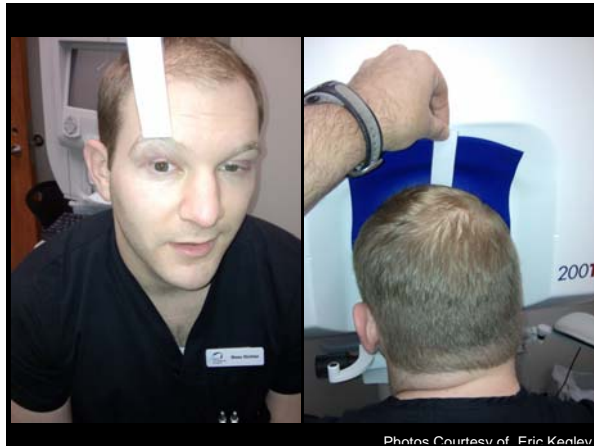


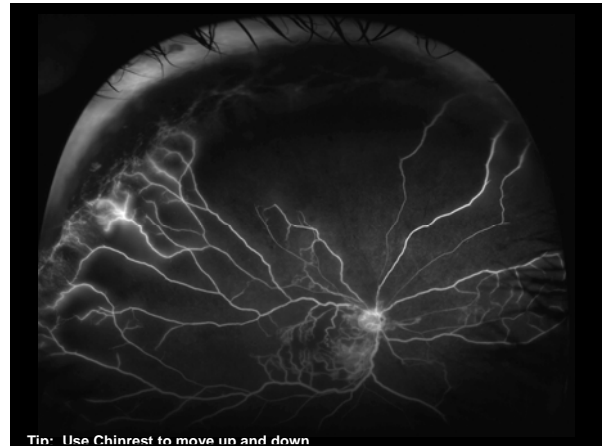
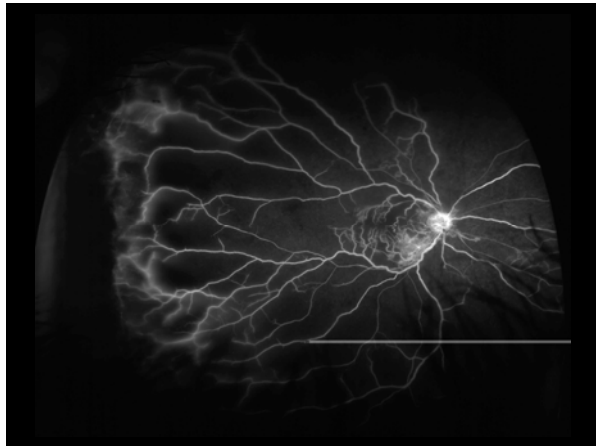
Optos

- Scanning Laser Ophthalmoscope
- Non-mydratic
- 200 degree field of view / 80% of retina
- Founded in 1992. Commercially available 2000.







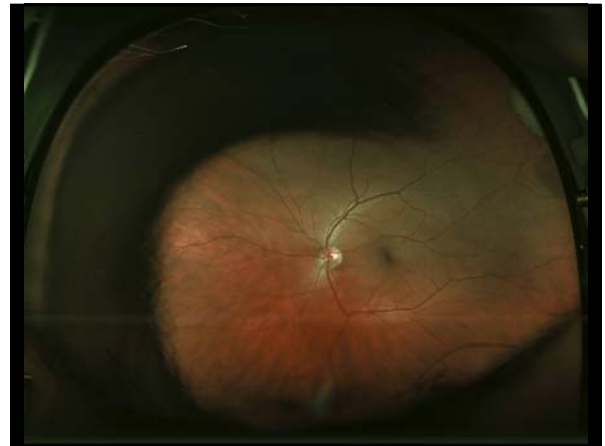


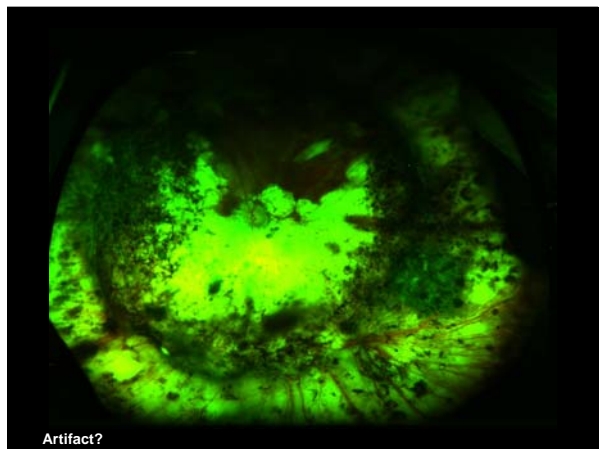
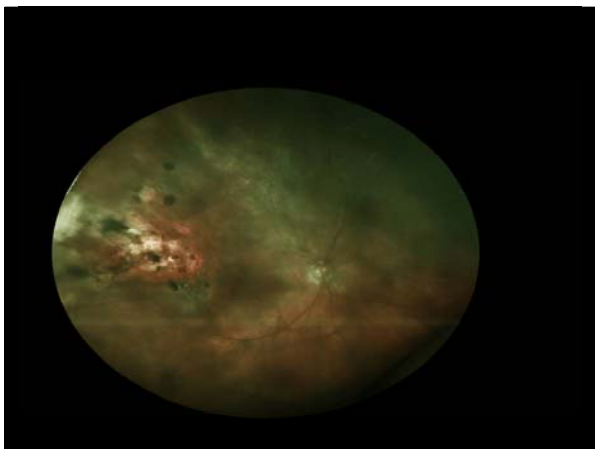
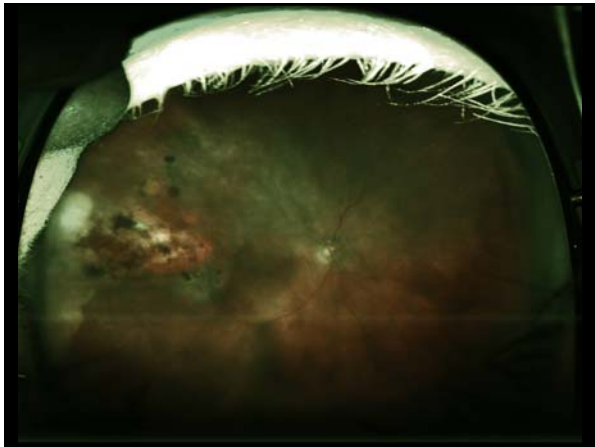
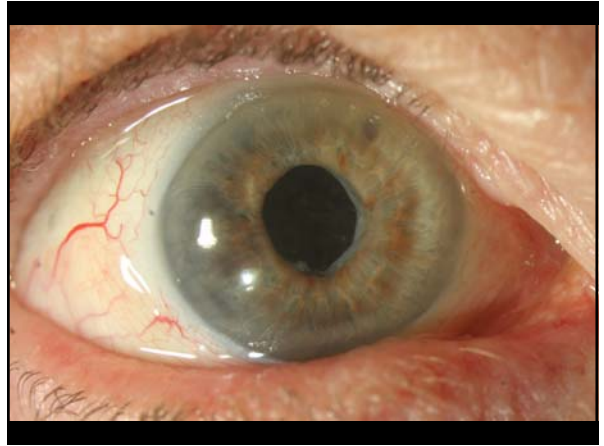
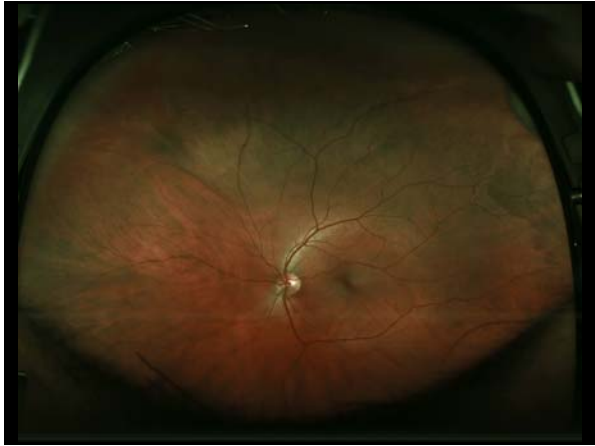
Tip: Use Chinrest to move up and down

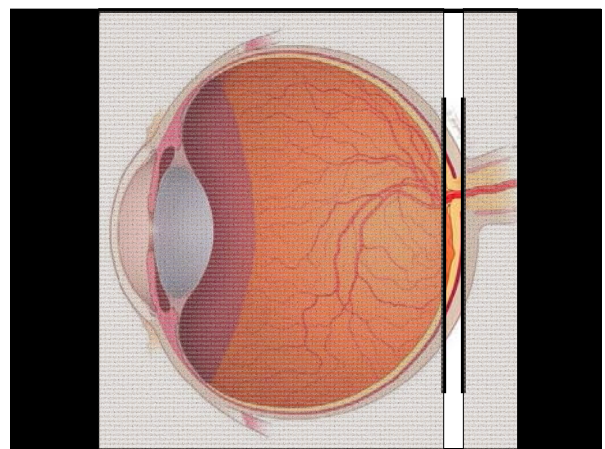
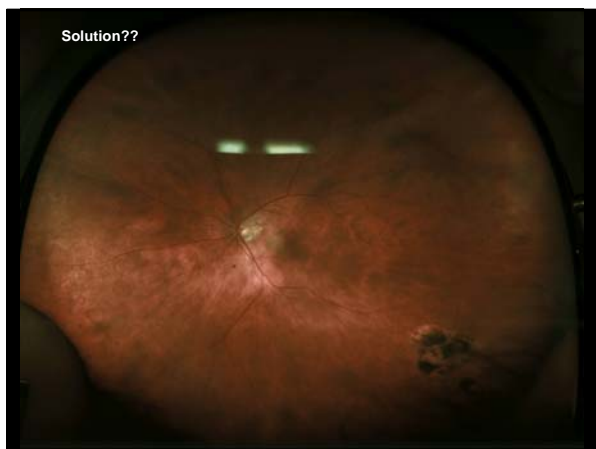
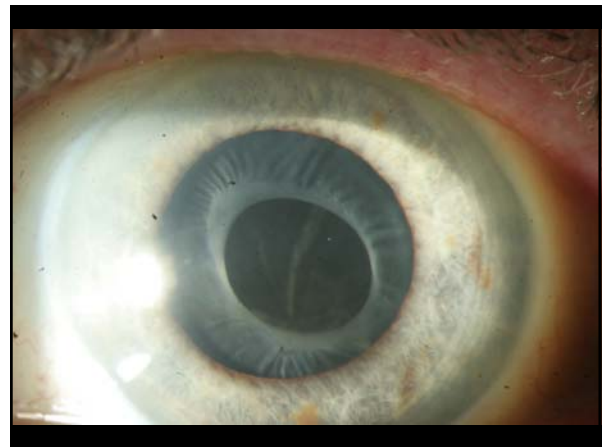
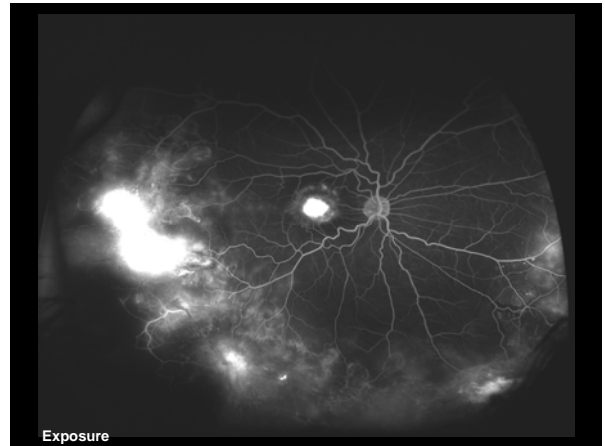


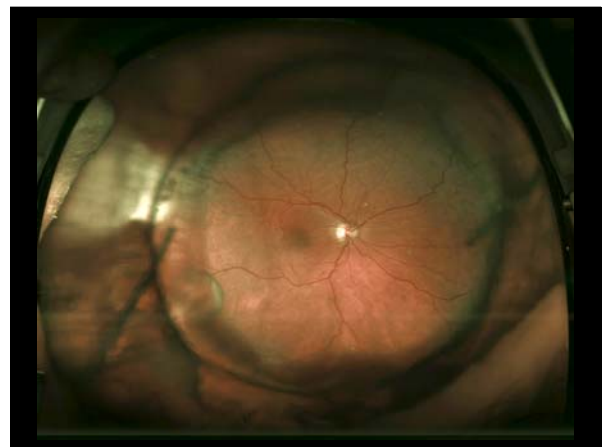
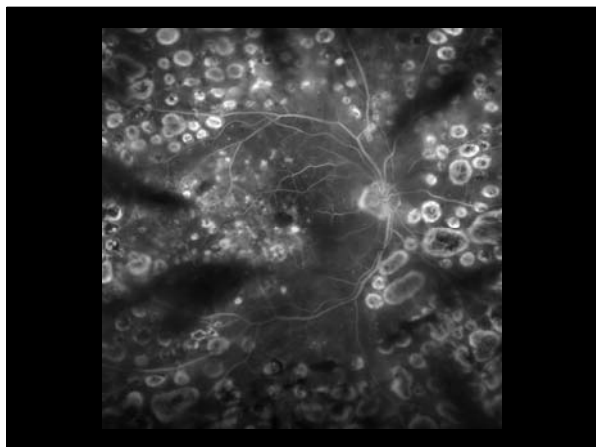
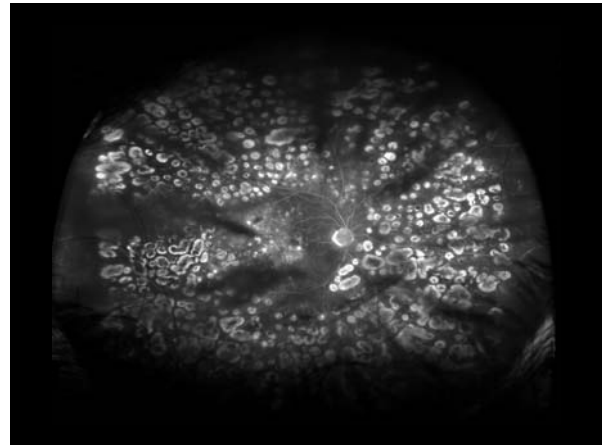
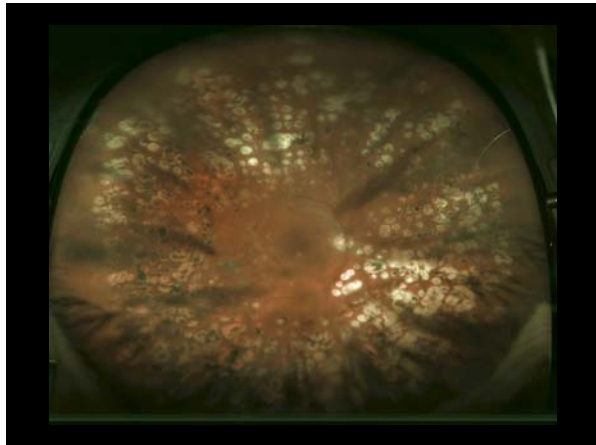
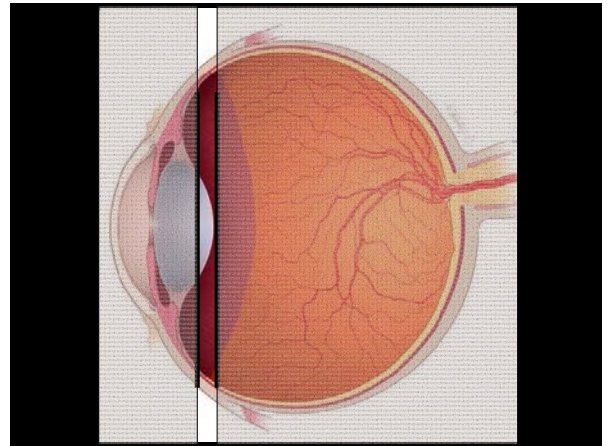
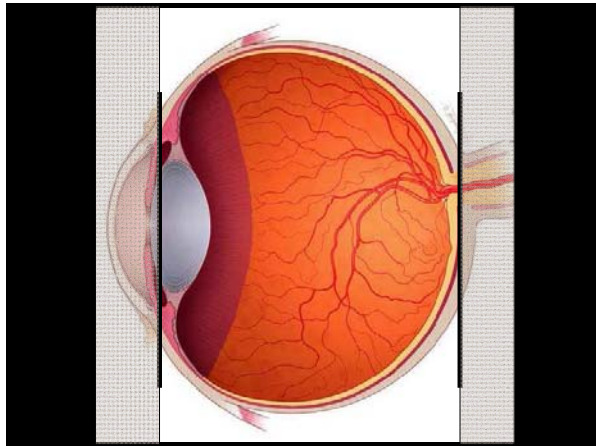
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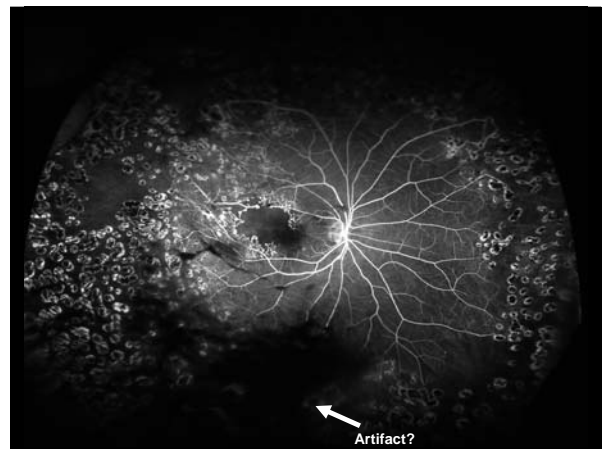
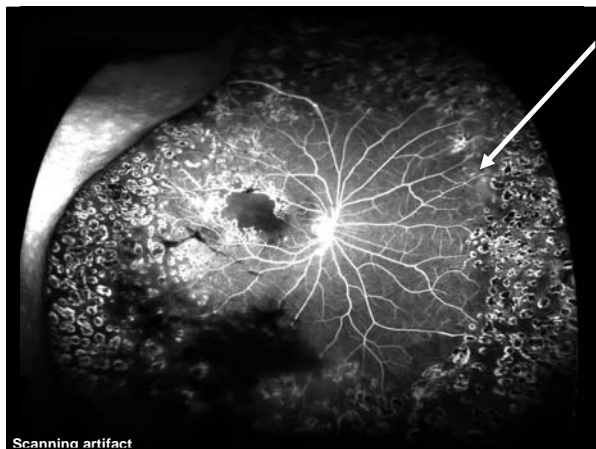
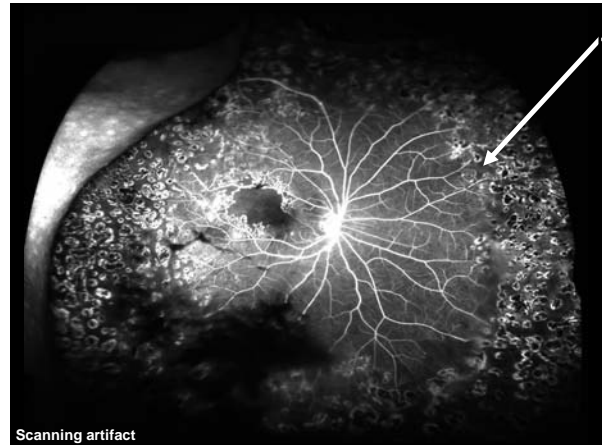
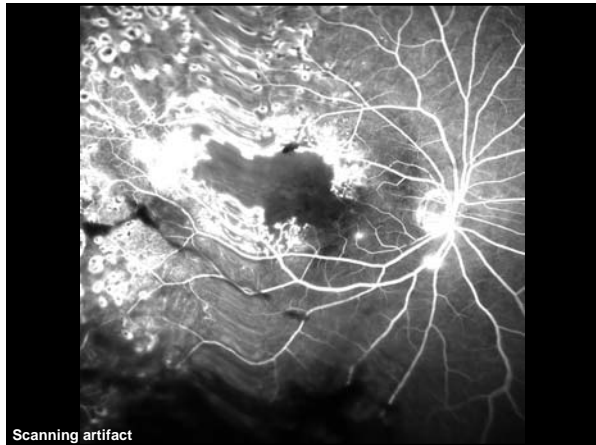
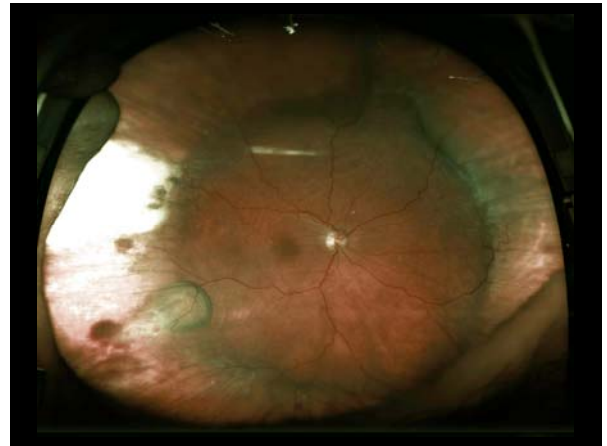
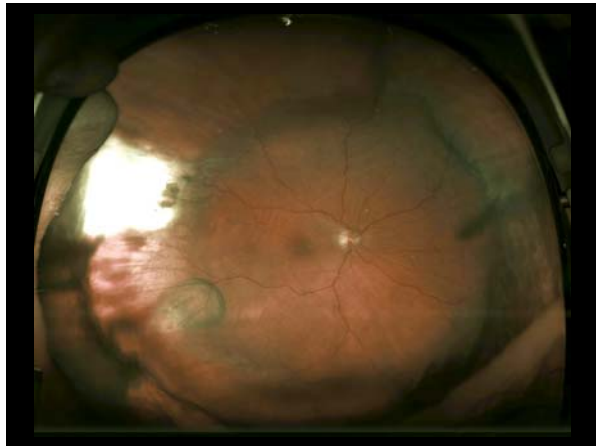
Artifacts

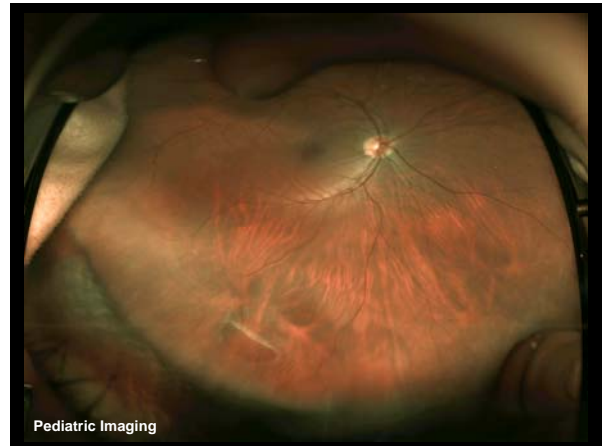
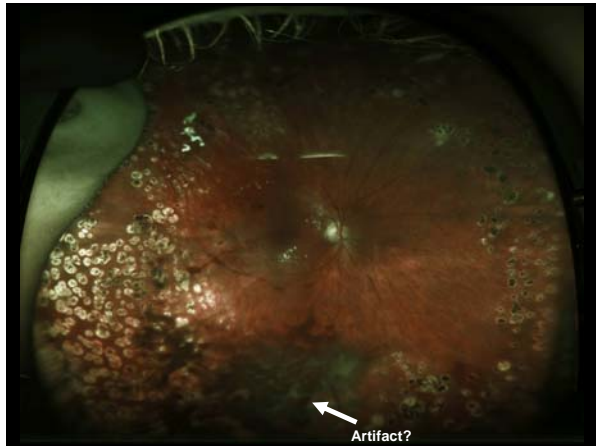






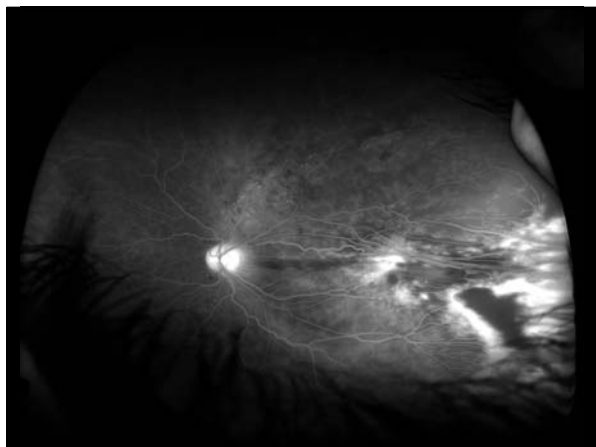






Optos	
<p>Advantages</p> <ul style="list-style-type: none"> • Easy to learn • Fast • Easy for children 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Artifacts (lids, exposure, lens) • Bulk export • Personal space

If I'm on time...
<ul style="list-style-type: none"> • How Wide Angle imaging benefited genetic testing....





Thank you!

Debra Cantrell, COA
Rona Lyn Esquejo-Leon, CRA
Eric Kegley, CRA