

Tracking Axonal Loss in the Retina.

The Mind's

Eye.

**SPECTRALIS®**

**HEIDELBERG  
ENGINEERING**

# Unraveling the course of multiple sclerosis

## Clinical diagnostics are often unclear

Assessing MS patients is challenging in all but the worst of cases. Although multiple tests are available, no one test is definitive. In addition, the tests do not always correlate with patient symptoms, can be subjective or affected by other physiological factors, and can be lacking in quantifiable measurement.

## Visual dysfunction is a leading cause of disability in MS<sup>1</sup>

As many as 50% of MS patients experience visual loss as a presenting symptom and up to 80% develop varying degrees of visual impairment over the course of their disease. Visual symptoms in MS may be present even among patients with normal Snellen acuities and those without a history of acute optic neuritis. For this reason, a variety of visual function tests have been used as diagnostic indicators in these patients.



Contrast Sensitivity



Multi-Focal Visual Evoked Potential



Ophthalmoscopic Exam

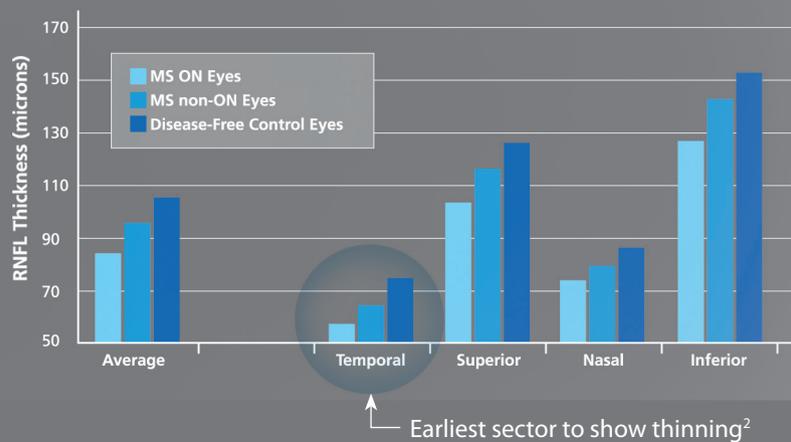
<sup>1</sup> Images Courtesy of Ami Cuneo, UCSF Multiple Sclerosis Center Vision Lab (Ari Green PI)

<sup>1</sup> Fisher JB, Jacobs DA, Markowitz CE, et al. Relation of visual function to retinal nerve fiber layer thickness in multiple sclerosis. *Ophthalmology*. 2006;113:324-332.

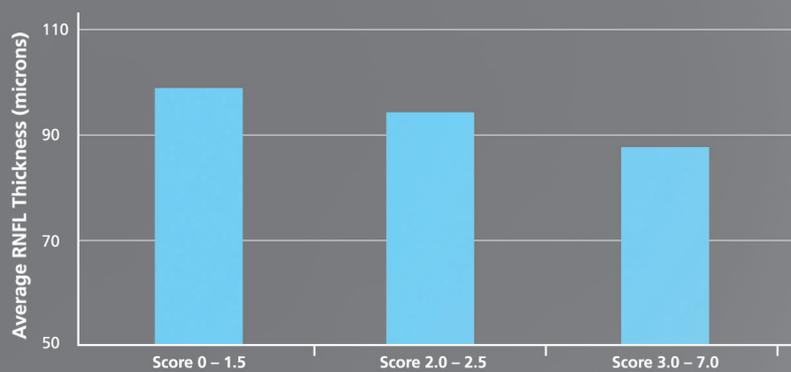
# Retinal changes can be precisely measured

Changes to retinal nerve fiber layer (RNFL) thickness reflect unmyelinated axonal loss and correlate with clinical function and physical disability.

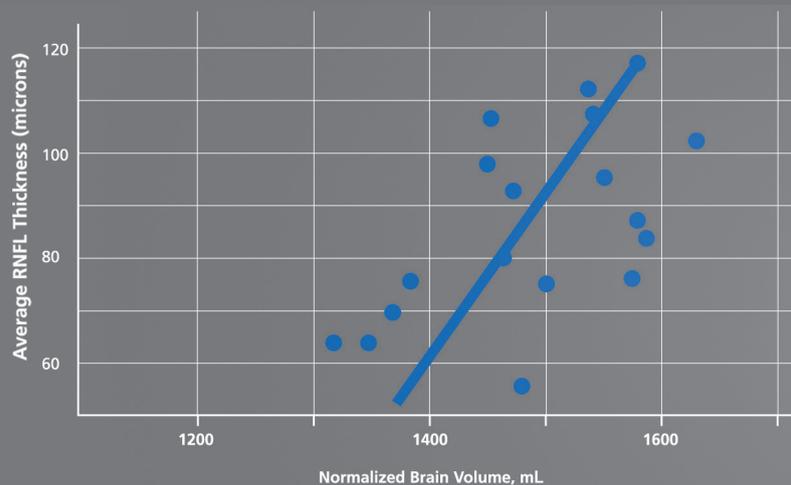
RNFL thinning is seen in MS patients with and without optic neuritis (ON)<sup>1</sup>



RNFL thinning is associated with physical disability (EDSS)<sup>1</sup>



RNFL thinning correlates with MRI brain lesions and atrophy<sup>3</sup>



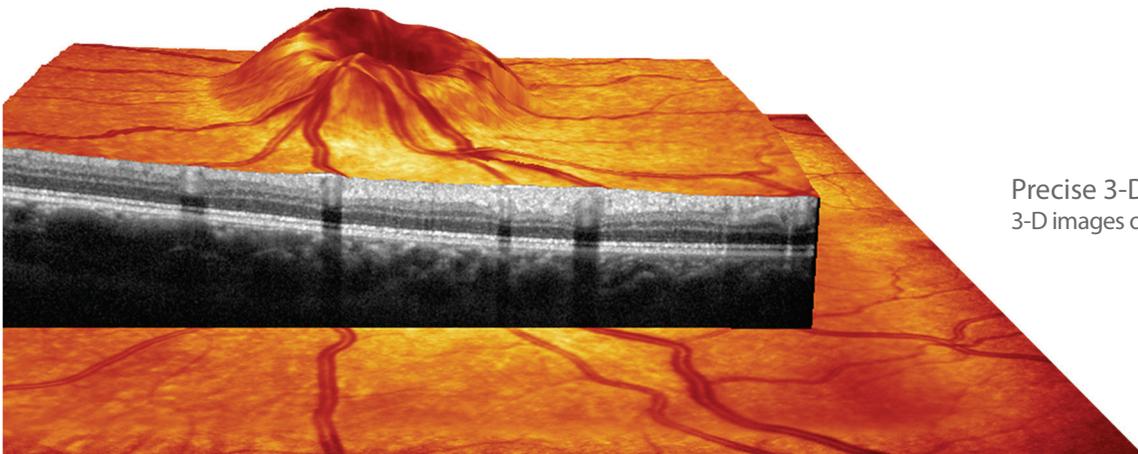
<sup>1</sup> Fisher JB, Jacobs DA, Markowitz CE, et al. Relation of visual function to retinal nerve fiber layer thickness in multiple sclerosis. *Ophthalmology*. 2006;113:324-332.

<sup>2</sup> Costello F, Hodge W, Pan Y, Eggenberger E, Coupland S, Kardon RH. Tracking retinal nerve fiber layer loss after optic neuritis: a prospective study using optical coherence tomography. *Mult Scler*. 2008;14:893-905.

<sup>3</sup> Grazioli E, Zivadinov R, Weinstock-Guttman B, et al. Retinal nerve fiber layer thickness is associated with brain MRI outcomes in multiple sclerosis. *J Neurol Sci*. 2008;268:12-17.

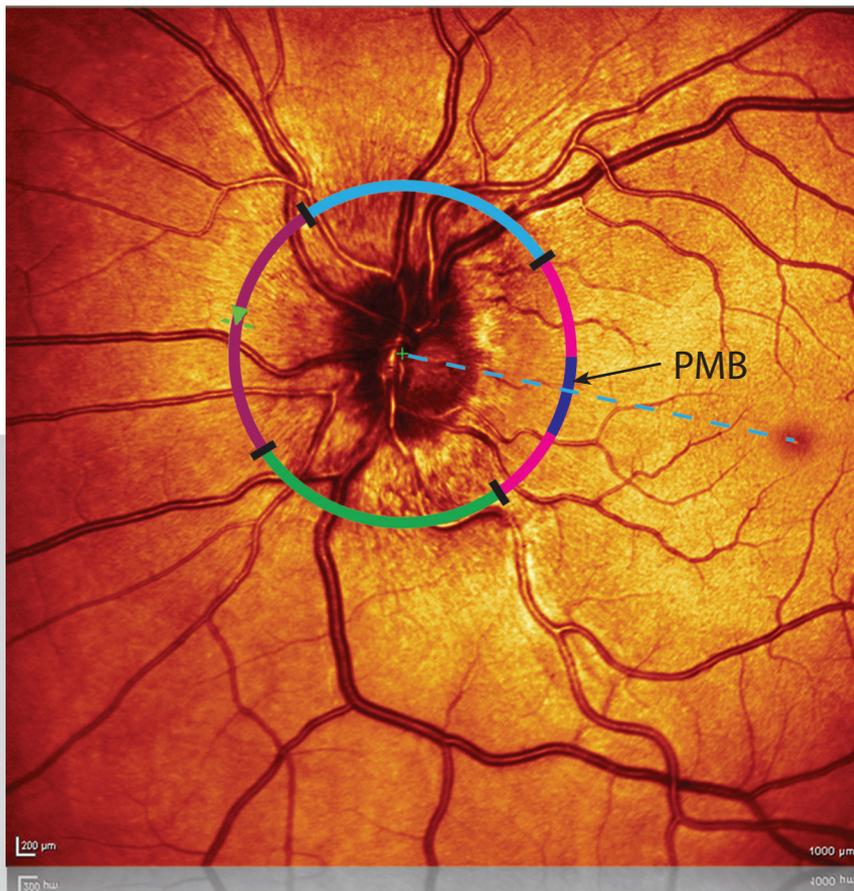
## Detailed imaging reveals axonal change

SPECTRALIS® Tracking Laser Tomography is a multi-modality imaging instrument which uses near-infrared light to image and measure the structures of the retina.



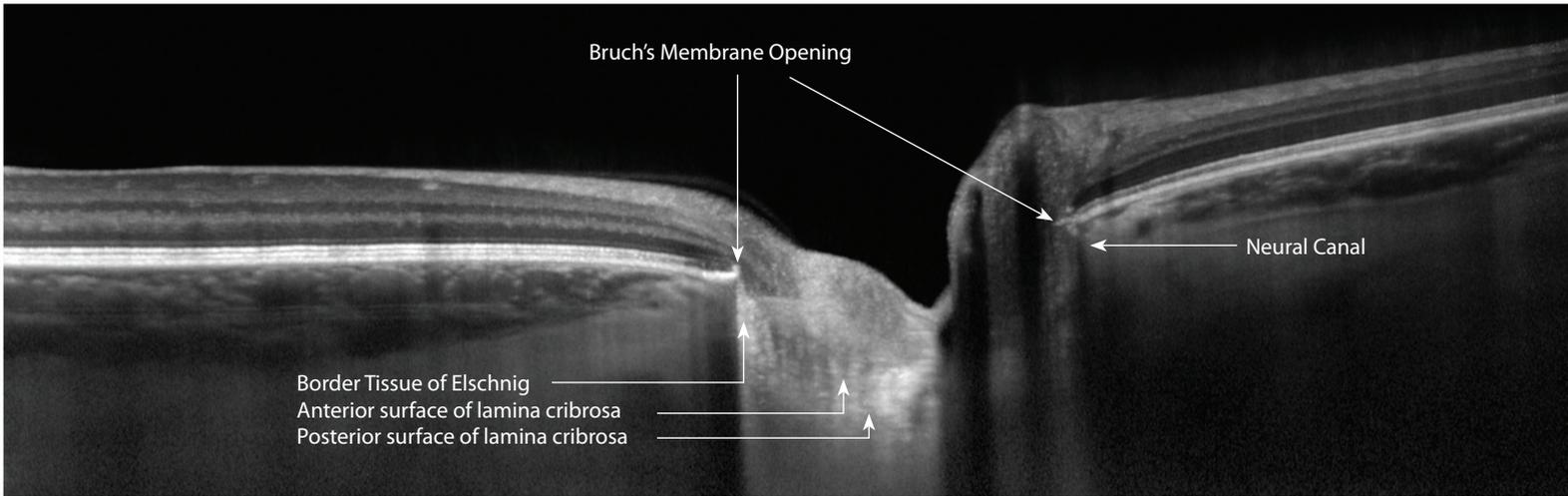
### Precise 3-D Imaging

3-D images of the retina can reveal structural changes.



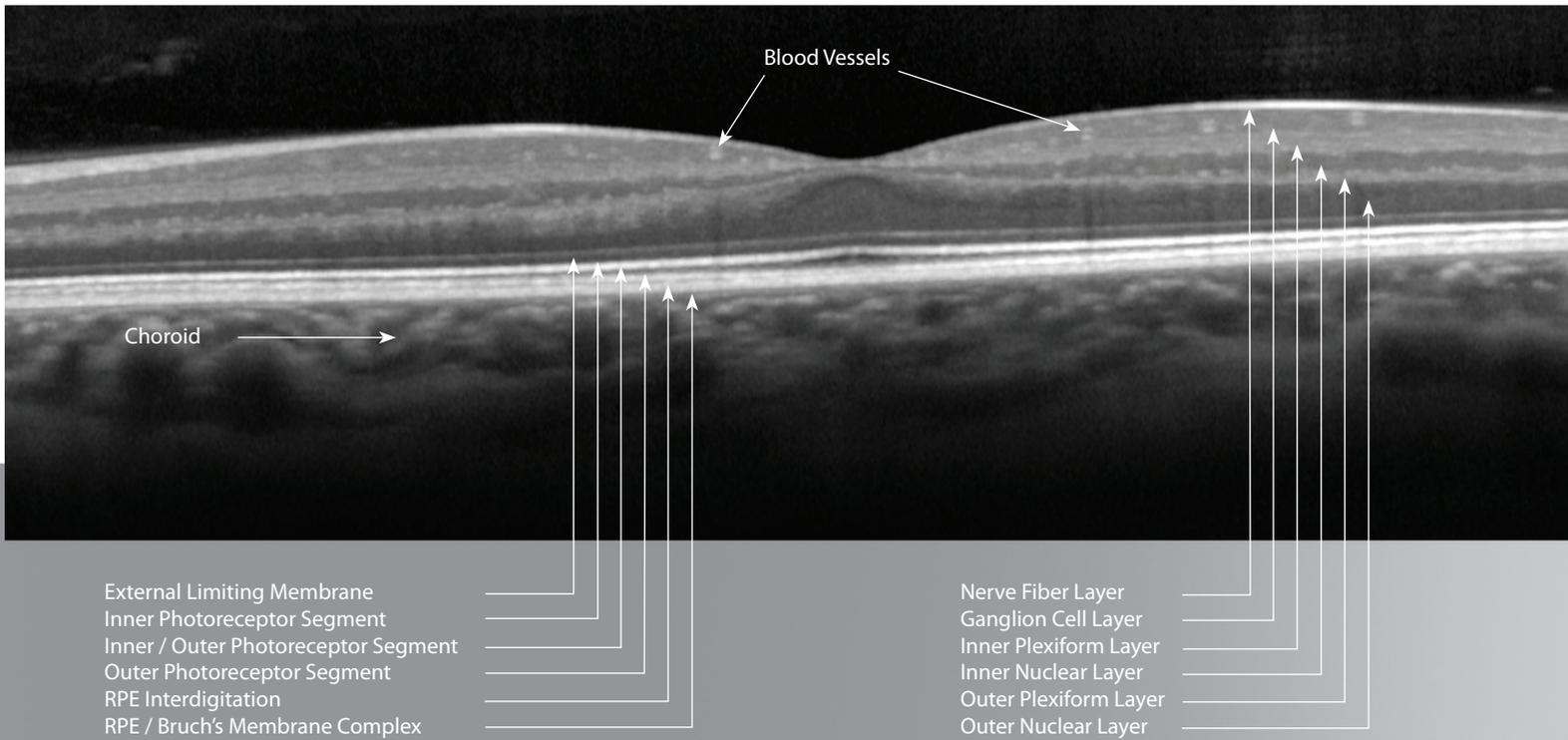
FoDi™ Automatic Fovea-to-Disc Alignment Studies have shown that greater RNFL thinning is more likely to be found in the temporal quadrant in MS patients with a history of acute optic neuritis.<sup>1</sup> The papillomacular bundle (PMB) may be most sensitive to this type of axonal damage. FoDi fovea-to-disc alignment correctly orients the anatomy for PMB measurement accuracy.

<sup>1</sup> Costello F, Hodge W, Pan YI, Freedman M, DeMeulemeester C. Differences in retinal nerve fiber layer atrophy between multiple sclerosis subtypes. J Neurol Sci. 2009;281:74–79.



### Optic Disc Detail

TruTrack™ Active Eye Tracking captures crisp clear details of the retinal layers with 100x the resolution of MRI, revealing disruption of the RNFL and other retinal structures which are often undetectable by ophthalmoscopic clinical examination.



### Retinal Layer Detail

TruTrack Active Eye Tracking enables image clarity and Heidelberg Noise Reduction™ imaging, capturing detailed retinal layer information.

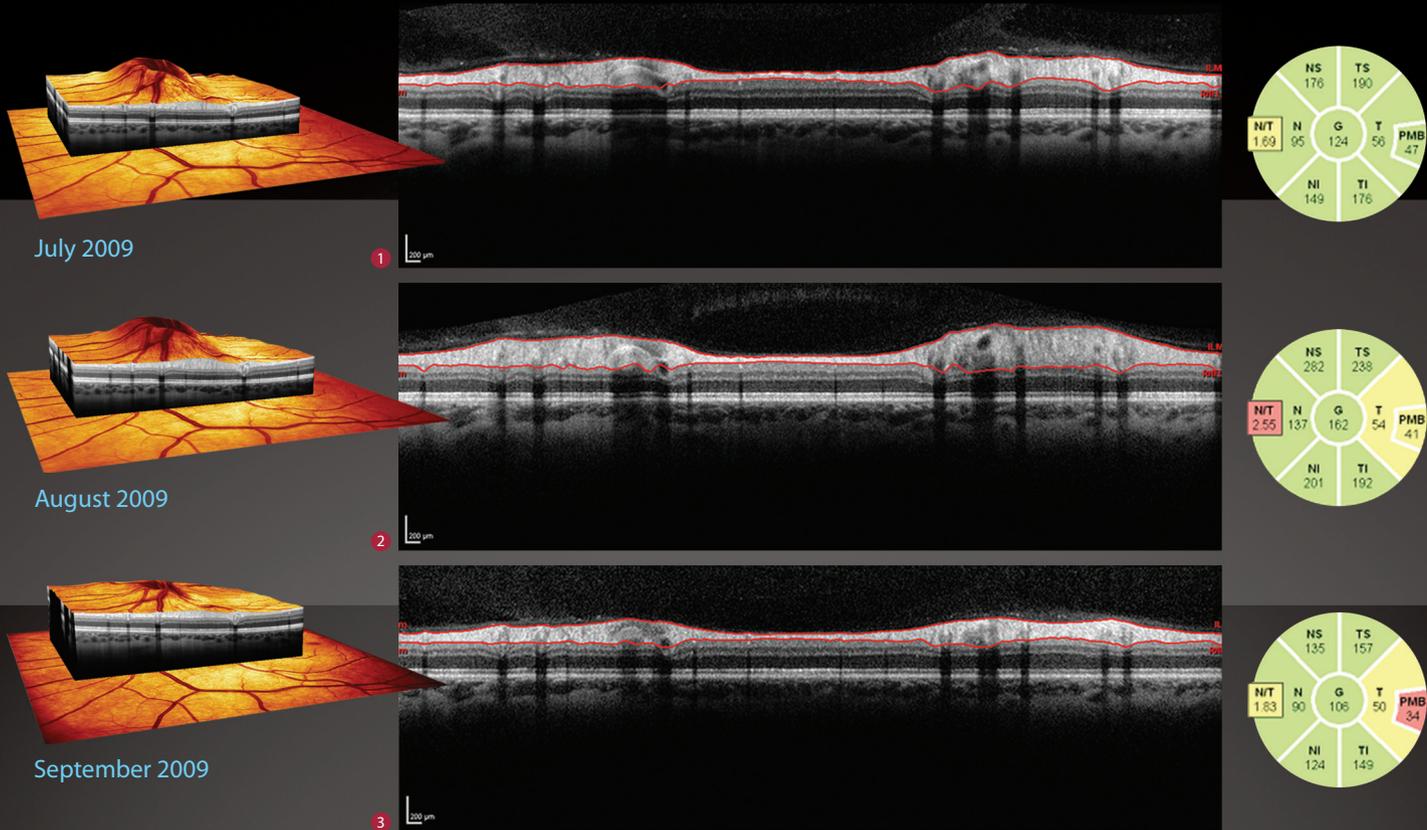
# Revealing damage over time

## Tracking axonal loss

The patient series below shows an MS patient with an episode of acute optic neuritis. In the first stage, the optic nerve edema shows no apparent effect on the nerve fiber layer thickness despite the edema. As the edema begins to subside at the second examination, thinning of RNFL in the temporal sector is revealed. By the time of the third visit, only two months later, both the temporal sector and the papillomacular bundle reveal the permanent damage to the axons.

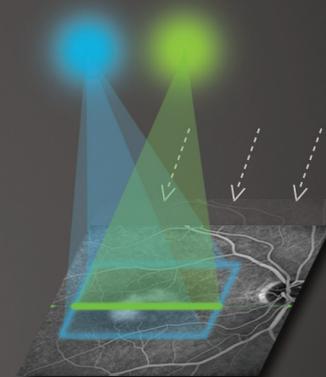
## Prepare for the next generation of therapeutics

As the next generation of therapeutics becomes available, tracking small changes may be helpful in making better informed clinical decisions. SPECTRALIS® is able to track small amounts of change to the retinal axons by minimizing motion artifact and automatically scanning in the same location at follow-up. Narrowing the range of variability using eye tracking technology is key to providing 1 micron smallest measurable change.<sup>1</sup>



## Dual-beam real-time eye tracking

By combining confocal scanning laser ophthalmoscopy (cSLO) with optical coherence tomography (OCT), SPECTRALIS is able to overcome the involuntary eye movements (microsaccades) that constantly occur. Two beams of light are directed at the retina, the first beam (cSLO) captures a fundus image that is then used to direct the second beam (OCT), precisely locating the cross-sectional image. This same method is used to automatically acquire the follow-up scan in the same anatomical location at subsequent visits.



Dual-Beam Real-Time Eye Tracking

<sup>1</sup> 2 3 Images Courtesy of Ami Cuneo, UCSF Multiple Sclerosis Center Vision Lab (Ari Green PI)

<sup>1</sup> Wolf-Schnurrbusch UE, Ceklic L, Brinkmann CK, et al. Macular thickness measurements in healthy eyes using six different optical coherence tomography instruments. Invest Ophthalmol Vis Sci. 2009;50:3432-3437.

# Advantages for your patients...and your practice

## Clinical Value

- Assessing and following RNFL and axonal change over time
- RNFL thinning seen in MS patients with and without ON
- Reduced RNFL thinning associated with physical disability
- RNFL thinning correlates with brain MRI lesions and atrophy

## Grow Your Practice

- Expand your diagnostic and service offerings
- Convey cutting-edge technology leadership to patients and community
- Use existing staff



## Patient Benefit and Education

- Office procedure
- Convenient and fast
- Noninvasive
- Lower cost to patient
- Patient education tool

## Our Commitment to You

- Customized clinical solutions for your unique needs
- Training and education for your staff
- Dedicated support and service
- Expandable multi-modality imaging platforms
- 20-year technology and company track record

Visit us at [Window2Brain.com](http://Window2Brain.com)



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