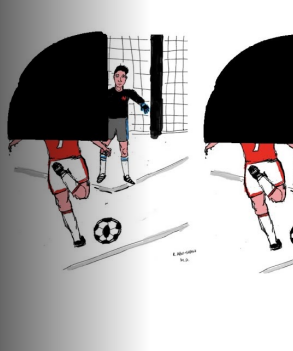


## Visual Fields, A Virtual Reality

Mitch Ibach, OD FAAO  
Vance Thompson Vision  
Residency Co-coordinator



1

## Financial Disclosures- Ibach

**Disclosure Statement:**  
Aerie - consultant/speaker  
Alcon - speaker  
Allergan - consultant  
Avellino - consultant  
Bausch Health -- consultant  
Dompe - consultant/speaker  
Equinox LLC-- shareholder  
Glaukos - consultant/speaker  
Heru - consultant/speaker  
Kala - consultant  
Ocular Therapeutix - consultant/speaker  
Oyster Point - consultant/speaker  
Sight Sciences - consultant/speaker  
Sun Pharma - speaker

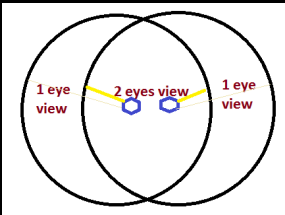


All relevant relationships have been mitigated.

2

## What is a visual field?

- **Visual Field (VF)** - Everything visible at a single time from one eye



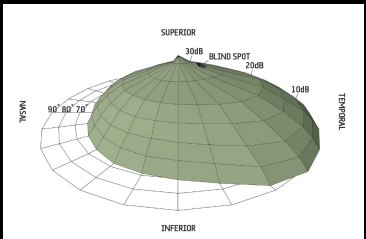
Performing a VF allows examiners to identify field loss in a specific location

3

## What is the Normal Field of Vision?

1. Temporal > 90°
2. Superior = 60°
3. Nasal = 60°
4. Inferior ~ 70°

\*relative to a fixation point



Right Eye

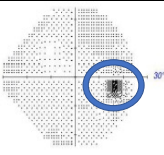

HELL, Anders, et al. The Field Analyzer Primer: Fifth Edition, 5th ed., Carl Zeiss Meditec, 2021.

4

## Physiologic Blind Spot – everyone has one

Physiologic Blind Spot - absolute scotoma (no sensitivity to light)

- Location of the optic nerve (ON) entering the eye (15° nasal)
- Optic nerve lacks photoreceptors
- Located 15° temporal to fixation
- Avg. blind spot is 7.5°

HELL, Anders, et al. The Field Analyzer Primer: Fifth Edition, 5th ed., Carl Zeiss Meditec, 2021.

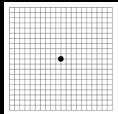

5

## Types of Visual Field

Amsler Grid → Testing macular/GCC function Central 10°

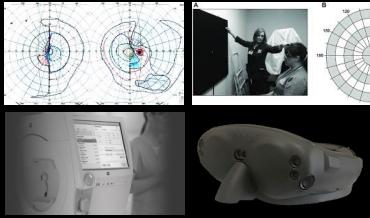
Confrontational VF → Screening test

Perimetry → Automated and manual Commonly 20°, 48°, 60°

6

## Perimetry



- **Kinetic Perimetry** - Test object is moved, but brightness and size are fixed.  
ie: Goldmann Perimetry and Tangent Screen
- **Static Perimetry** - Test object is fixed, but brightness and size are varied.  
ie: HFA, Octopus VF, Headset VF

7

## Standard Automated Perimetry (SAP)

Quantifies the sensitivity of a patient's peripheral vision (Not all or none)

- Standardized testing algorithms
- Quantifiable threshold test (grading)
- Measures 30° from fovea/fixation

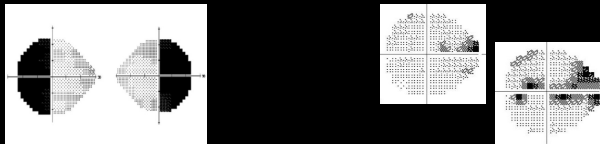


8

## 2 Goals of Perimetry

Detect and Diagnose Visual Field Abnormalities

Determine progression of Visual Field Abnormalities



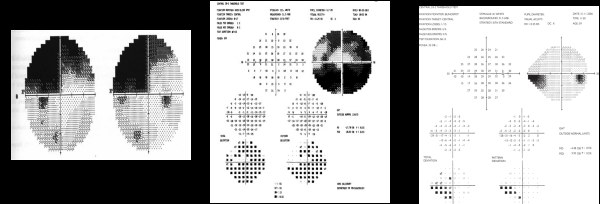
9

## Conditions that may require VF's

Neurologic diseases

Retinal diseases

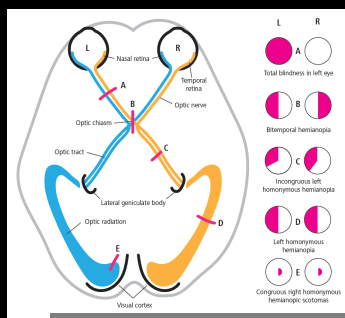
Glaucoma



10

## Neurologic - Understanding the Visual Pathway

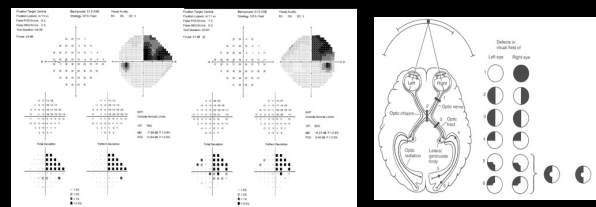
1. Retina damage can be partial scotomas
2. Optic chiasm and posterior = bilateral VF loss (B)
3. More posterior damage = more congruent (matching) defects



Blasi, Anders, et al. The Field Analyzer Primer. Fifth Edition. 5th ed., Carl Zeiss Meditec, 2021.

11

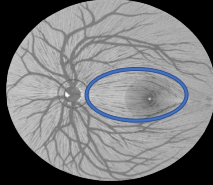
## Where is the Cut/damage?



12

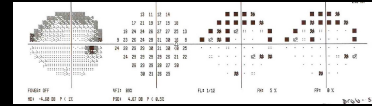
## Retina VF Loss

- Monocular VF loss
- Commonly more central VF loss
  - 60-70% of optic nerve fibers compose the macular region



13

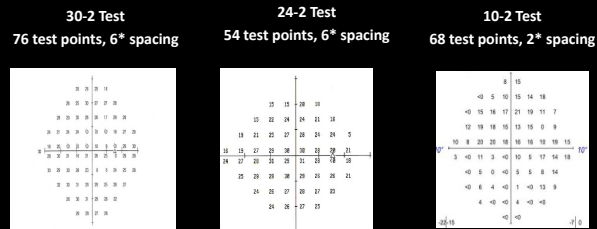
## Glaucoma VF Loss



- Definition of glaucoma includes the VF
- Perimetry is the #1 way to assess VF
- #1 goal of glaucoma therapy is to preserve VF and ultimately visual acuity (VA)

14

## Zeroing in on Threshold VF's for Glaucoma



Heil, Anders, et al. The Field Analyzer Primer: Fifth Edition, 5th ed., Carl Zeiss Meditec, 2021.

15

## If Fast is Good, Faster is Better



ReVive 2: Threshold test avg.-  
3min 30 sec.

Heil, Anders, et al. The Field Analyzer Primer: Fifth Edition, 5th ed., Carl Zeiss Meditec, 2021.

16

## A New SITA Perimetric Threshold Testing Algorithm: Construction and a Multicenter Clinical Study

ANDREW HEIL, VINCENT MICHAEL, PATRICIA LEE, Y. CHONG, AND HANS CHRISTOPHER S. LIEBIG, ANJA TULLOSEN, GARY C. LEE, THOMAS GALLAN, AND ROEL BENJAMINSON

• PURPOSE: To describe a new time-saving threshold thresholding algorithm (DFA) from which is derived the new SITA perimetric threshold testing algorithm.

• OBSERVATIONS: This study is a multicenter clinical study. The DFA is a new thresholding algorithm (DFA) from which is derived the new SITA perimetric threshold testing algorithm.

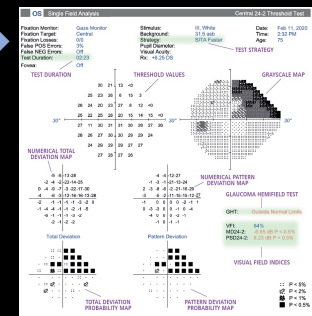
30.4% shorter than SITA Fast  
53.5% shorter than SITA Standard



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## Analyzing a Threshold VF

1. Fixation losses – poor fixator <30%, or restart
2. False Positives: happy clicker <15% or repeat
3. False Negatives: bored sleeper <20%

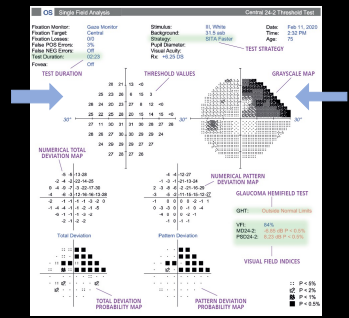


Mumli, D (2021, February 15). Breaking Down Visual Fields in Glaucoma. Review of Ophthalmology. Heil, Anders, et al. The Field Analyzer Primer: Fifth Edition, 5th ed., Carl Zeiss Meditec, 2021.

18

### Analyzing a Threshold VF

1. Threshold values: measured decibel sensitivity at each point
2. Gray scale: Patient education map  
Darker areas equals less sensitivity

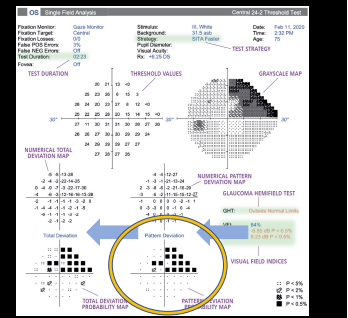


Mumfitt, D. (2021, February 15). Breaking Down Visual Fields in Glaucoma. *Review of Ophthalmology*. Heil, Anders, et al. *The Field Analyzer Primer: Fifth Edition*. 5th ed. Carl Zeiss Meditec. 2021.

19

### Analyzing a Threshold VF

1. Total Deviation: deviation from age-matched normal on each test point
2. Pattern Deviation: deviation measured in decibels but removes distractors
3. Probability maps: TD and PSD → plots statistical significance of missed points

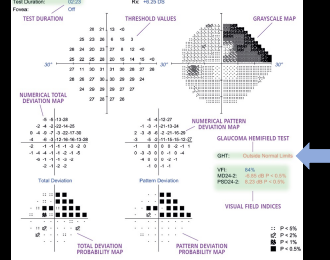


Mumfitt, D. (2021, February 15). Breaking Down Visual Fields in Glaucoma. *Review of Ophthalmology*. Heil, Anders, et al. *The Field Analyzer Primer: Fifth Edition*. 5th ed. Carl Zeiss Meditec. 2021.

20

### Analyzing a Threshold VF

1. GHT: compares mirror image clusters of points above and below midline
2. MD-24: weighted average of values in TD plot
3. Visual Field Index (VFI): enhancement of MD with emphasis on central field
4. PSD-24: summarizes VF loss but ignores general depression

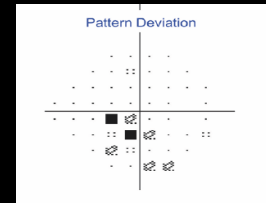
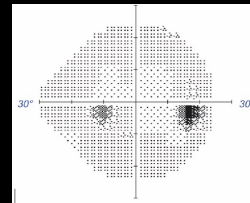


Mumfitt, D. (2021, February 15). Breaking Down Visual Fields in Glaucoma. *Review of Ophthalmology*. Heil, Anders, et al. *The Field Analyzer Primer: Fifth Edition*. 5th ed. Carl Zeiss Meditec. 2021.

21

### Common Glaucomatous Visual Field Defects

#### Paracentral Scotoma/Defect

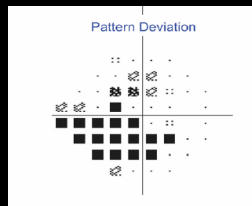
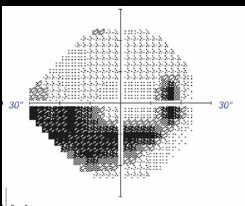


Heil, Anders, et al. *The Field Analyzer Primer: Fifth Edition*. 5th ed. Carl Zeiss Meditec. 2021.

22

### Common Glaucomatous Visual Field Defects

#### Arctuate Defect: Bjerrum scotoma

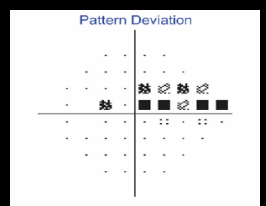
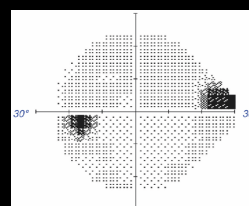


Heil, Anders, et al. *The Field Analyzer Primer: Fifth Edition*. 5th ed. Carl Zeiss Meditec. 2021.

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### Common Glaucomatous Visual Field Defects

#### Nasal step defect

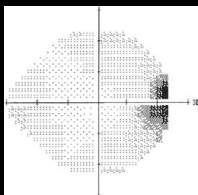


Heil, Anders, et al. *The Field Analyzer Primer: Fifth Edition*. 5th ed. Carl Zeiss Meditec. 2021.

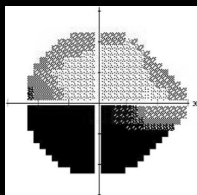
24

## Less Common 1\* Glaucomatous VF Loss

Temporal wedge



Altitudinal defect



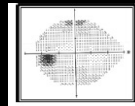
Walt, M., Lee, E., Watzek, R., Cheng, L., & Torpe, A. (2020, March). Temporal Wedge Defect in Glaucoma: Structural-Functional Correlation With Threshold Automated Perimetry of the Left Visual Field. *Journal of Glaucoma*, 29(3).

25

## What Stage of VF Loss?

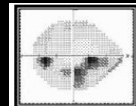
American Glaucoma Society /AAOphthalmology PP Guidelines

Mild



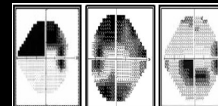
- ONH abnormalities &
- No VF loss
- Screening VF loss Ok

Moderate



- ONH abnormalities &
- GL VF loss 1 hemifield
- No VF loss within 5° fixation

Severe



- ONH abnormalities &
- GL VF both hemifields &/or
- VF loss within 5° fixation

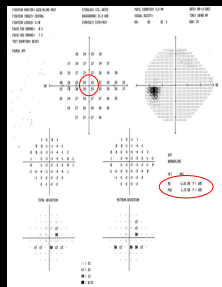
26

## Hodapp-Parrish-Anderson: Mild

MD < -6dB

PD Plot – less than 14 points are depressed below the 5% significance level and fewer than half of those points are depressed below the 1% level

None of central four points has sensitivity of <15dB



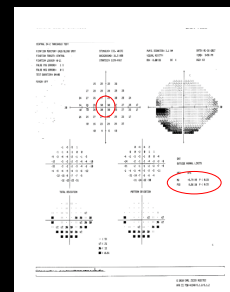
27

## HPA: Moderate

MD -6dB to -12dB

PD Plot – 14 -28 points are depressed below the 5% significance level or 8-16 points are below the 1% level

One central point measures < 15 dB



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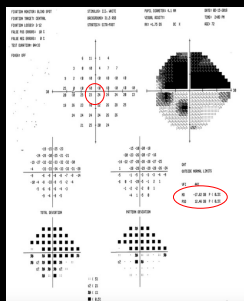
## HPA: Severe

MD > -12db

PD Plot – 28 points or more are depressed below the 5% significance level or more than 16 points are below the 1% level

Any one central point at 0 dB

Both Hemifields in central 5 degrees <15dB



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## What is VF Progression?

- How many fields are needed?
  - Event based– can detect worsening on 2 fields
  - Trend based– Need minimum 3 tests
- What is the gold standard for VF progression?
  - See picture
  - Negative rate change 1db/year minimum 2 tests/year
  - Rapid progression 2db/year minimum 6tests/year

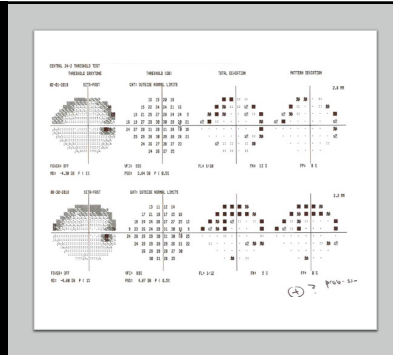


Art, A., & Bahner, D. (2017, December). Detecting Visual Field Progression. *Ophthalmology*, 124(12).

30

### Manual Progression Analysis

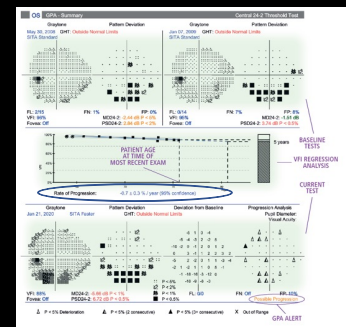
1. MD and PSD quantitative values
2. PSD Plot
3. \*\*Compare to structure\*\*



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### Guided Progression Analysis (Zeiss)

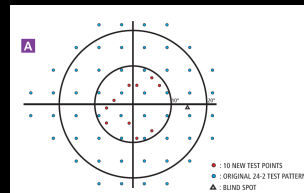
1. 3 tests needed to assess
2. Focus on glaucoma shifting from "Is there progression," to "What is the rate of progression?"



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### What's New in Visual Field Testing?

#### Humphrey Field Analyzer



Hell, Anders, et al. The Field Analyzer Primer: Fifth Edition, 5th ed., Carl Zeiss Meditec, 2021.

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#### Current Potential Problems

- Bottleneck to clinic flow
- Declining reimbursements
- Requires dedicated room & lighting
- Reduced patient comfort, positioning



#### Virtual VF Solutions

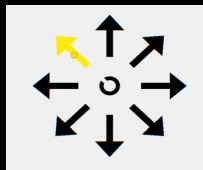
- Improved efficiency with multiple devices
- Allows for potential home testing and telehealth
- No dedicated room/space needed
- Automated tests, easier on patient positioning



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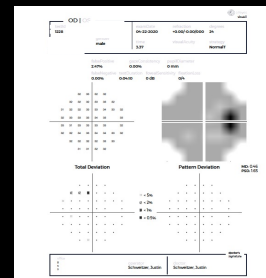
### Olleyes VisuALL VR VF

- VisuALL S
  - In Office
  - 24-2/10-2/Suprathreshold
- VisuALL H
  - Home model
- VisuALL Acuity
  - Landolt C




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### Portable Wearable VR Testing



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### Heru Portable VR VF



**re: Threshold Algorithm**

Adapts and predicts an optimized full-threshold testing workflow in a shorter testing time without compromising clinical performance.

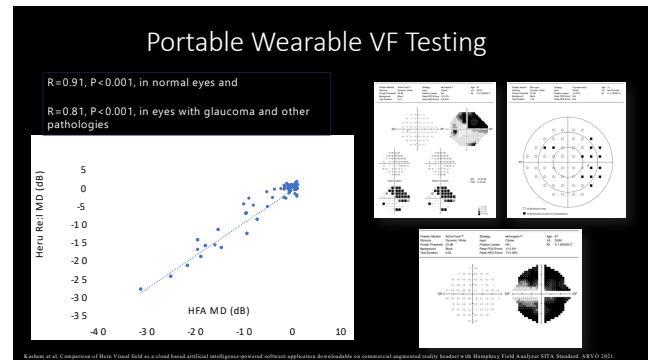
**Autoflow™**

Autoflows from a screening test to a threshold test

**ActiveTrack™**

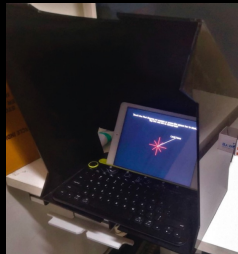
Real-time gaze tracking confirms the patient's fixation is always appropriate, improving data quality and lessening repeat testing

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### Melbourne Rapid Fields



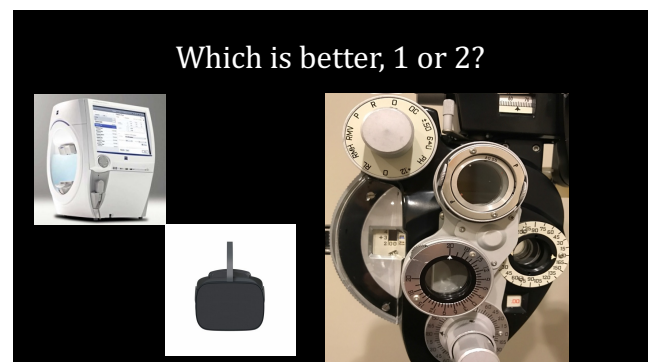
**Clinical Study**  
**Comparison of Perimetric Outcomes from Melbourne Rapid Fields Tablet Perimeter Software and Humphrey Field Analyzer in Glaucoma Patients**

Harsh Kumar and Mihir Thakurda

**Conclusion: MRF may be questionable for early detection compared to other options.**

Kumar, H., & Thakurda, M. (2020, August 24). Comparison of Perimetric Outcomes from Melbourne Rapid Fields Tablet Perimeter Software and Humphrey Field Analyzer in Glaucoma Patients. *Journal of Ophthalmology*.

39



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### Visual Field Pearls

Perimetry allows function assessment

Neurologic defects are bilateral

Retinal defects are monocular

match perimetry to nerve cupping


Wearable Devices compare well to HFA

Visual fieldS are a must in glaucoma

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### THANK YOU & PEACE

mitch.libach@vancethompsonvision.com



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On behalf of Vision Expo, we sincerely  
thank you for being with us this year.

**Vision Expo Has Gone Green!**

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Conference Advisory Board considers content and speakers for future meetings to provide you with the best education possible.

