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## OPTICAL MYTHS, HALF TRUTHS AND FALSEHOODS

## HOW WE'LL PROCEED

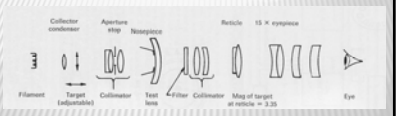
I'll put up a statement

You guess the answer
- Yes –no
- True-false

Lensometers Don't Read Power

True!

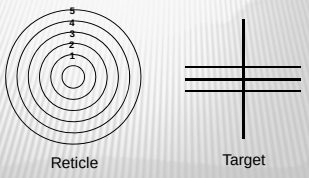
## HOW A LENSOMETER FOCUSES




You Focus the Lensometer Using the Target Circles

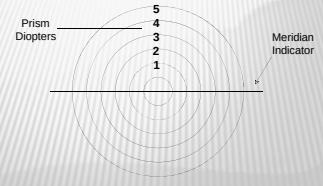
False

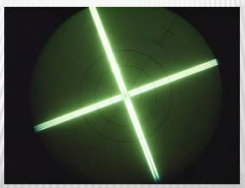
## WHICH IS WHICH?




## KNURLED RING WHAT'S IT FOR?

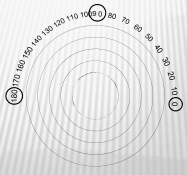
## READING PRISM



## THE MERIDIAN NOTATION FOR PRISM

From your right to your left - as you face the glasses




## HOW TO FOCUS THE LENSOMETER'S EYEPIECE

1. **TURN THE INSTRUMENT OFF**
2. Turn the eyepiece counterclockwise as far as it will go
3. Place a piece of white paper where the lens should go
   - To block the target's view
4. Slowly turn the eyepiece in the clockwise direction until the reticle becomes clear.
   - Stop! This is the correct focus point

* If you pass the clear focus point, go back to step 1 after 5 - 10 seconds

## EYEPIECE FOCUSING QUESTIONS

- Why do you focus on the reticle and not the target?
- Why do you turn the eyepiece counterclockwise instead of clockwise when you start focusing?
- Why can't you pass the clear point of focus?
- From which direction (the plus side or the minus side) should you read lens powers?

## THE POWER DRUM


You have focused the lensometer correctly (using the reticle). You then place a plano lens in the instrument and neutralize its power. The power drum reads +0.37D. What is wrong?

## LENSOMETER STOP

## BEWARE OF THE MISALIGNED LENS STOP!

- Can come loose from normal use
- If lens stop is too far away from the lensometer:
  - Plus lenses will read too strong
  - Minus lenses will read too weak
- If the lens stop is too close to the lensometer:
  - Plus lenses will read too weak
  - Minus lenses will read too strong
- The stop can be adjusted using the tiny set screws around the collar

## LENSOMETER STOP SET SCREWS

A Lens Reads the Same Power no Matter Which Side of the Lens is Touching the Lens Stop

False

## THICK LENS FORMULA

$$P = D_1 + D_2 + \frac{T}{N} \times D_1^2$$

$$P = D_1 + D_2 + \frac{T}{N} \times D_1^2$$

Nominal Lens Formula — Shape & Thickness Factor

## LOOK WHAT THICKNESS DOES TO A LENS

Front Curve: +16.00
Back Curve: -4.37

Thickness = 6.8mm
Index = 1.530

$+12.75 = +16.00 + (-4.37) + \frac{-0.0068}{1.530} \times +16.00^2$

+12.75 = +11.63 + 1.12 — Where did the +1.12 come from?

Note: +16.00 – 4.37 = +11.63 (not +12.75)

**The nominal lens formula is wrong!**

## NOW, TURN THE LENS AROUND

$P = (-4.37) + 16.00 + \frac{-0.0068}{1.530} \times -4.37^2$

P = 11.63 + (0.08)

P = +11.71

Note: +16.00 = (– 4.37) still = +11.63

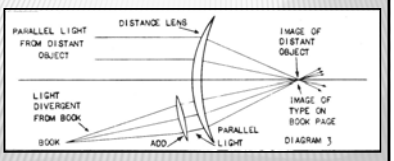
But now the shape & thickness factor only adds +0.08

## HOW TO READ AN ADD POWER

(OF FRONT SURFACE SEGMENTS)

- Verify the distance Rx with the CC side against the lens stop
- Turn the lens around
  - so the CC side is touching the lens stop
- Position the lens to read through the distance zone
- Take a power reading using only one portion of the target
- Reposition the lens to read through the segment zone
- Take the reading through the sgement
  - using the same target lines used in the distance
- Take the difference between the two backside readings. This is the add power

## THE OPTICS OF ADD FOCUSING




## READING ADD POWER

| **Bifocal Rx** | **Distance Reading** |
|---|---|
| +5.00 +1.00 x 180 | +4.87 (Backwards) |
| Add: +2.00 | |
| | |
| **Distance Reading** | **Segment Reading** |
| (CC to the lens stop) | +6.87 (Backwards) |
| +5.00 | |
| | **Add Power: +2.00** |
| | |

## WHAT ABOUT POSITION-OF-WEAR FREE-FORM LENSES?

- Original Rx
- Compensated Rx
  - For vertex distance, tilt, etc.
- Verify the compensated Rx

## VARILUX® IPSEO® ORDERING

To verify Varilux Ipseo, use the "Rx in Lensometer" reading on the packing slip...

| | Rx Ordered | Sphere | Cylinder | Axis |
|---|---|---|---|---|
| R | Vx Ipseo 1.67 | +1.00 | -0.25 | 25 |
| L | Vx Ipseo 1.67 | +1.50 | | |

| | Rx in Lensometer | Sphere | Cylinder | Axis |
|---|---|---|---|---|
| R | Vx Ipseo 1.67 | 0.99 | -0.27 | 21 |
| L | Vx Ipseo 1.67 | 1.46 | -0.03 | 17 |

*If the measured cylinder value is ≥ 0.200, the axis for the measurement pow

AR Coating is Needed More on High Index Lenses Than on Low Index Lenses

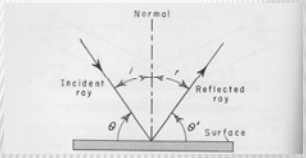
True!

## FRESNEL'S EQUATION

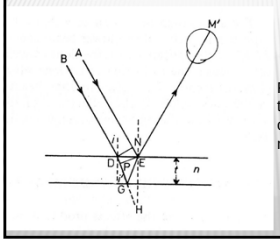
$$I_R = \left( \frac{N - 1}{N + 1} \right)^2 * I_O$$

Where:
$I_R$ = the intensity of reflected light
N = index of refraction of the lens material
$I_O$ = the intensity of the light falling perpendicularly on the lens

## LAW OF REFLECTION

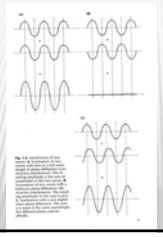



## INTERFERENCE BY A THIN FILM

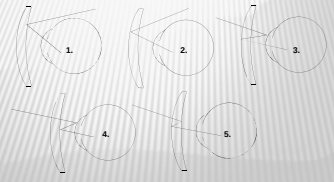



Film must be ¼ the wavelength of the lens material

## INTERFERENCE



## LENS REFLECTIONS

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## FOR A CR-39 LENS

First Surface: $I_R$ = 3.99 %
Second Surface: $I_R$ = 3.83 %

Total Reflection: $I_R$ = 3.99 % + 3.83 % = 7.82%

## REFLECTION % FOR VARIOUS LENS MATERIALS

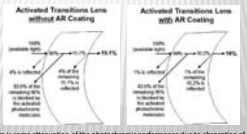
| Lens Material | Refractive Index | Total Transmittance | Total Reflection |
|---|---|---|---|
| CR-39 | 1.498 | 92.4% | 7.8% |
| Crown Glass | 1.523 | 91.4% | 8.6% |
| Polycarbonate | 1.586 | 89.7% | 10.3% |
| High Index 1 | 1.670 | 87.8 | 12.2% |
| High Index 1 | 1.701 | 87.0% | 13.0% |
| High Index 2 | 1.740 | 85.9% | 14.1% |

Does An AR Treatment Affect Photochromic Performance?

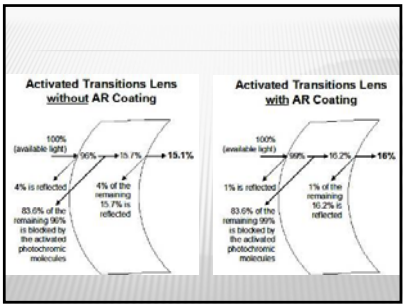
Nope! (Less than 1%)

## AR TREATMENT AND PHOTOCHROMIC PERFORMANCE

- Virtually no loss of photochromic ability when an AR treatment is used
- AR treatment makes the photochromic lens even clearer indoors and fights distracting glare

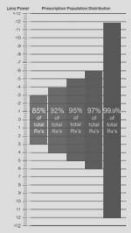



NOTE: There is some attenuation of the photochromic performance due to absorption of the UV by the materials in the AR treatment.




68% of the Rx's Used Everyday Fall Between +/-3.00D

False



Rx Distribution

**Where is the greatest concentration of prescriptions found?**

The vast majority of prescriptions fall in the range of +3.00D to -3.00D. In fact, 85% of prescriptions fall in this category.

From +4.00D to -4.00D, you will be covering 92% of prescriptions.

At +5.00D to -5.00D, you'll encompass 95% of prescriptions.

At +6.00D to -6.00D, you'll cover 97% of prescriptions.

Another way to analyze this data is to notice that while **85%** of Rxs fall in the +3.00D to -3.00D range, only **7% more** Rxs are added by going to +4.00D and -4.00D, **only 3% fall** in the +4.00 to +5.00D and -4.00 to -5.00D category, and **only 2% fall** in the +5.00 to +6.00D and -5.00 to -6.00D category. All higher Rxs represent **only 3% of the total Rx** range mix.

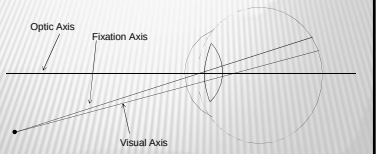
## YOU CAN'T MEASURE AN ACCURATE PD WITH A RULER

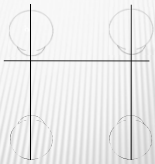
You can't … and you don't want to!

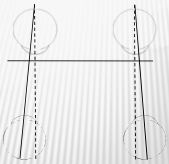
## YOU CAN'T MEASURE AN ACCURATE PD WITH A RULER

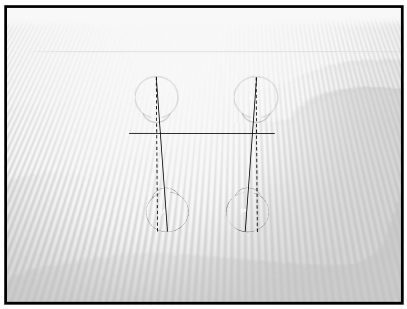
- What is that you actually want to measure when taking a PD?
- You actually DON'T want to measure the "PD"!
  - You actually want to measure:
    *The separation between the visual axes as they cross the spectacle plane for a specified viewing location*

## AXES OF THE EYE



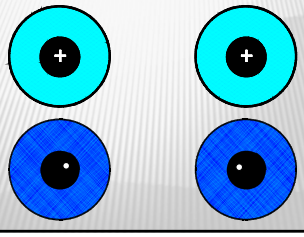


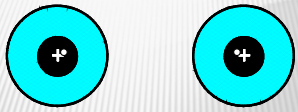


## MEASURING THE PD

- Corneal reflex pupilometer

## PUPILLARY DISTANCE VS. VISUAL AXES SEPARATION





- 0.3mm error per eye
- 0.6mm error binocularly

## WHAT ABOUT MONOCULAR PDS?

- Just as bad … if not worse!
- What about using a penlight and ruler?
  - Still a poor substitute for a PD instrument

## RECOMMENDATIONS

- Avoid the ruler!
- Use a corneal reflex measuring instrument
  - + Measure quickly
    - Uses prisms
    - Eye fatigue can affect results
- Use an EESIS to measure
  - + Super accurate – automatically!

## VISIOFFICE

Table Top

Column

## FRAME SELECTION

With its digital technology, Visioffice can photograph and film patients to help them with frame selection. The result can be printed and given to them.

- An indispensable feature for high Rx patients.

***There's a lot of patients who would like to see what they look like in their frames***

## ACCURATE MEASUREMENT

- **Visioffice provides highly precise results – free of the parallax effect :** < 0.5mm for distances – The nearest degree for angles

**Real-time analysis of the head angle:**

- During video shot, Visioffice identifies the most natural head posture and the most appropriate shot to deliver the parameters.

## USER FRIENDLY

- **Quick measurement** : Less and 2 minutes to take all measurements inclusing Eye Rotation Center, vertex, height, pantoscopic angle, etc.
- Interfaces with Visionweb on line ordering or print out to fax to lab

## WHAT ABOUT THE NEAR PD AND THE RULER?

- Just as bad … maybe worse depending on your technique

Photochromic Lenses Are An Unnecessary Luxury

False!!!!!

## POTENTIAL PROBLEMS LIGHT CAUSES THE EYE

- Light outdoors is 25 times more powerful than indoor light
- Bright light & glare can be a problem causing fatigue, headaches and eyestrain
- Night vision may be affected if filters are not worn during the daytime
- UV poses a threat to the long-term health of the eye

## THE SOLUTION

- The way to alleviate these concerns is to
  - Regulate light levels
  - Control glare
  - Protect the eye from harmful UVR
- How?
  - Use photochromic lenses to recreate natural vision
    - Makes vision sharper, clearer, bolder and more comfortable

Tinted Lenses Reduce Glare

Well – Yes and No

## HOW MANY KINDS OF GLARE ARE THERE?

- 1?
- 2?
- 3?
- 4?

There are 4 kinds!

## WHAT IS GLARE?

- "The annoyance or discomfort of vision, or the impairment of it caused by light levels (luminance levels) in the field of vision higher than the level the eye has adapted to."
- Luminance
  - A method used to indicate the brightness
  - The higher the luminance, the brighter the object

## TYPICAL ENVIRONMENTAL LUMINANCES

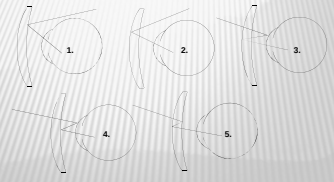
| Lighting Condition | Luminance |
|---|---|
| | |
| Indoor, artificial light | 400 lumens |
| Sunny day, shady side of street | 1000 to1400 lumens |
| Sunny day, sunny side of street | 3500 lumens |
| Concrete highway | 6000 to 8000 lumens |
| Beach or ski slopes | 10000 to 12000 lumens |

## FOUR TYPES OF GLARE

- Distracting Glare
- Discomforting Glare
- Disabling Glare
- Blinding Glare

- Distracting glare
  - Caused by lens reflections and ghost images
  - Causes eye fatigue, reduced vision and annoyance

Lens Reflections




- Discomforting glare
  - Caused by changes in lighting, from indoors to bright sunlight
  - Causes squinting, eye fatigue and discomfort

- Disabling glare
  - Caused by sunlight exceeding 10,000 lumens
  - Causes blocked vision, eye fatigue, squinting and diminished contrast

- Blinding glare
  - Caused by acute reflected glare off of shiny surfaces
  - Causes squinting, blocked vision, diminished contrast and eye fatigue

## WHAT OFFERS THE BEST LENS PROTECTION FROM GLARE?

- No one solution will do it all, multiple solutions are needed
  - Distracting: AR clear or AR photochromic
  - Discomforting: AR photochromic
  - Disabling: Fixed tint, photochromic or polarized
  - Blinding: Polarized
- What about AR for fixed tint and polarized lenses?
  - Absolutely! Why?

## THANKS FOR ATTENDING!

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