



SULCOFLEX TRIFOCAL DUET

Reversible Modular Multifocality

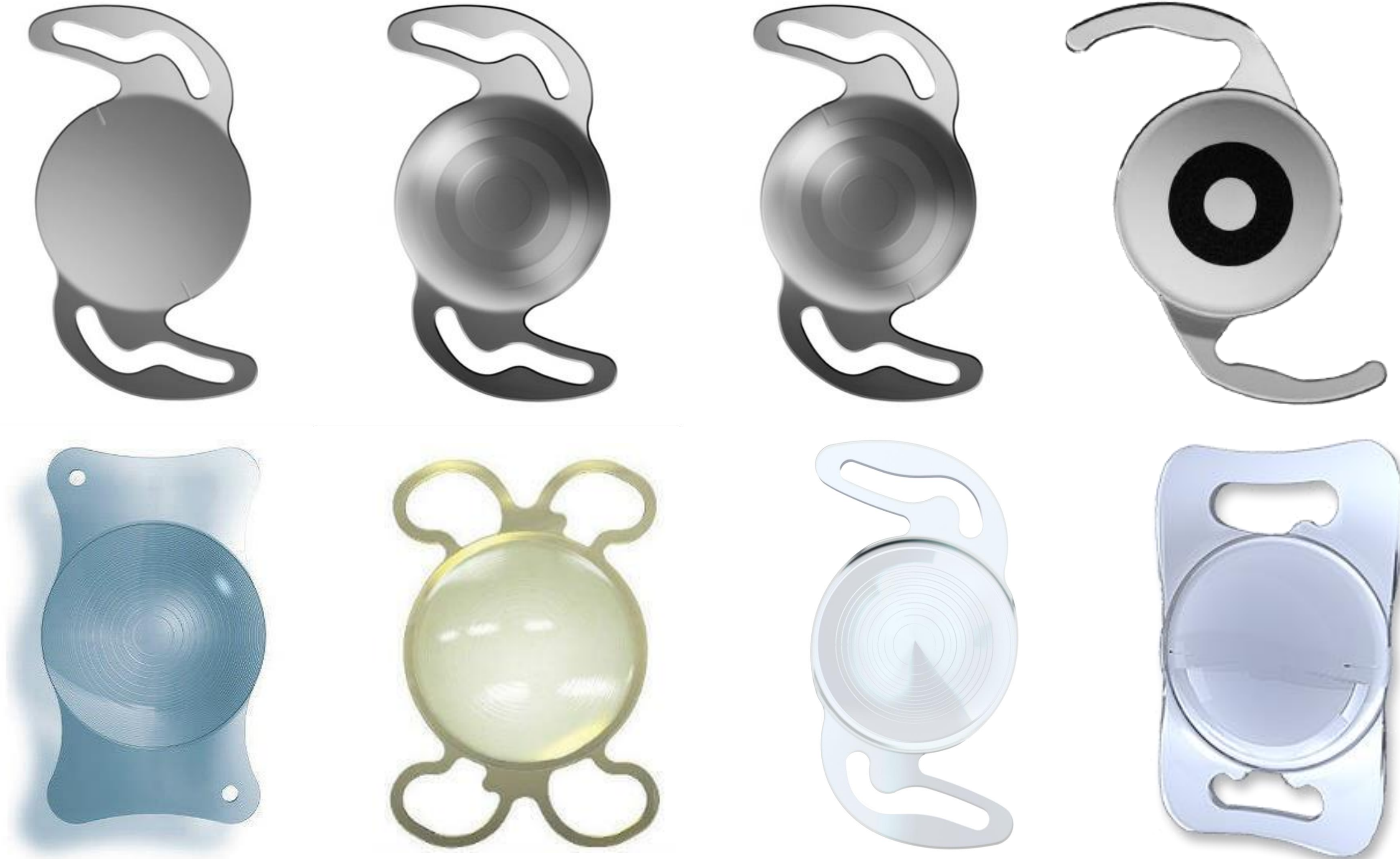
Rakesh Jayaswal

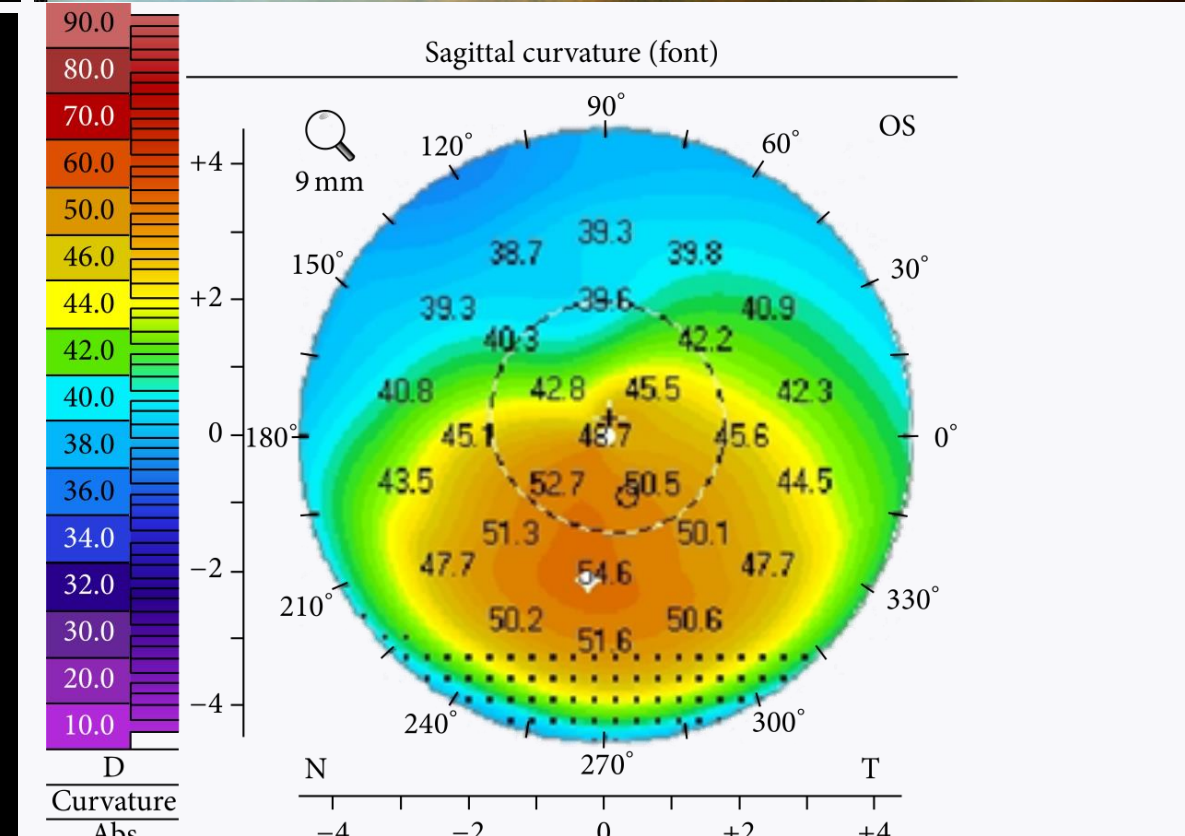
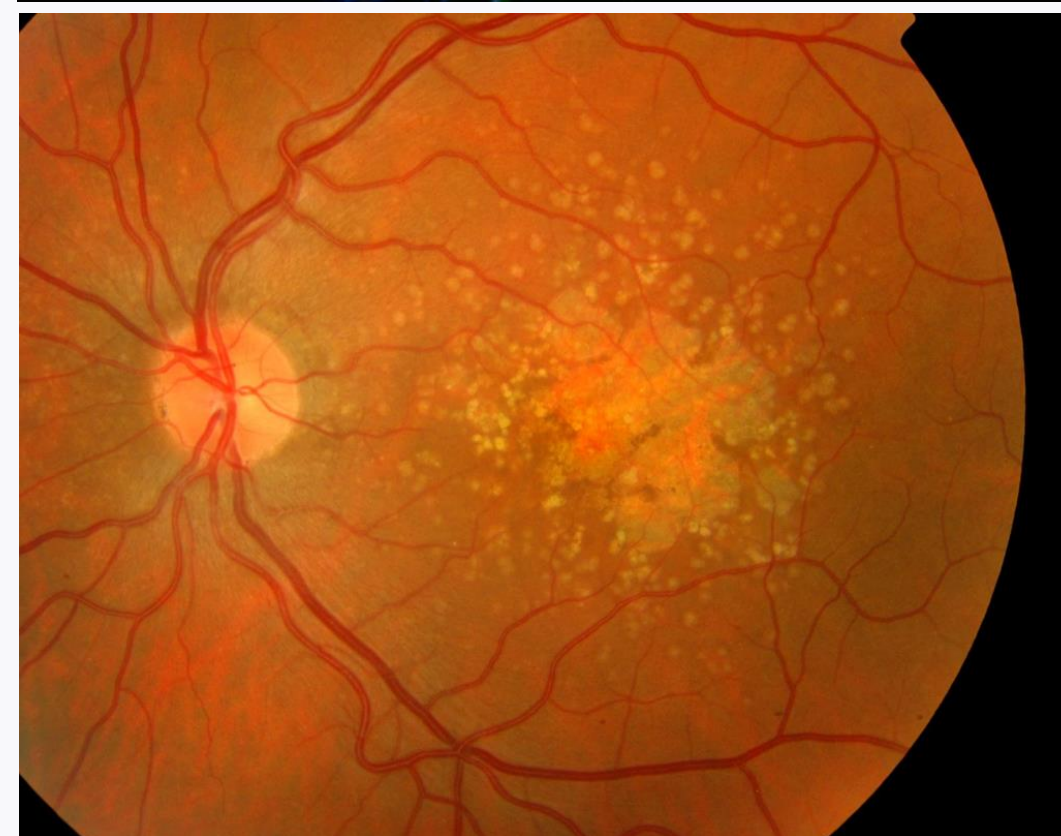
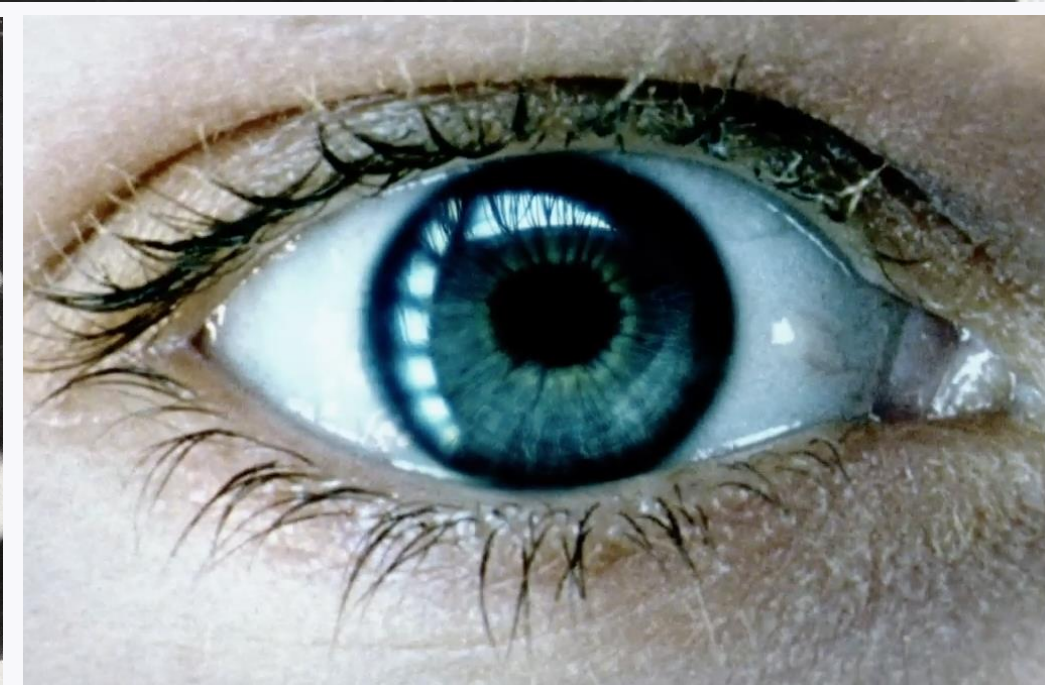
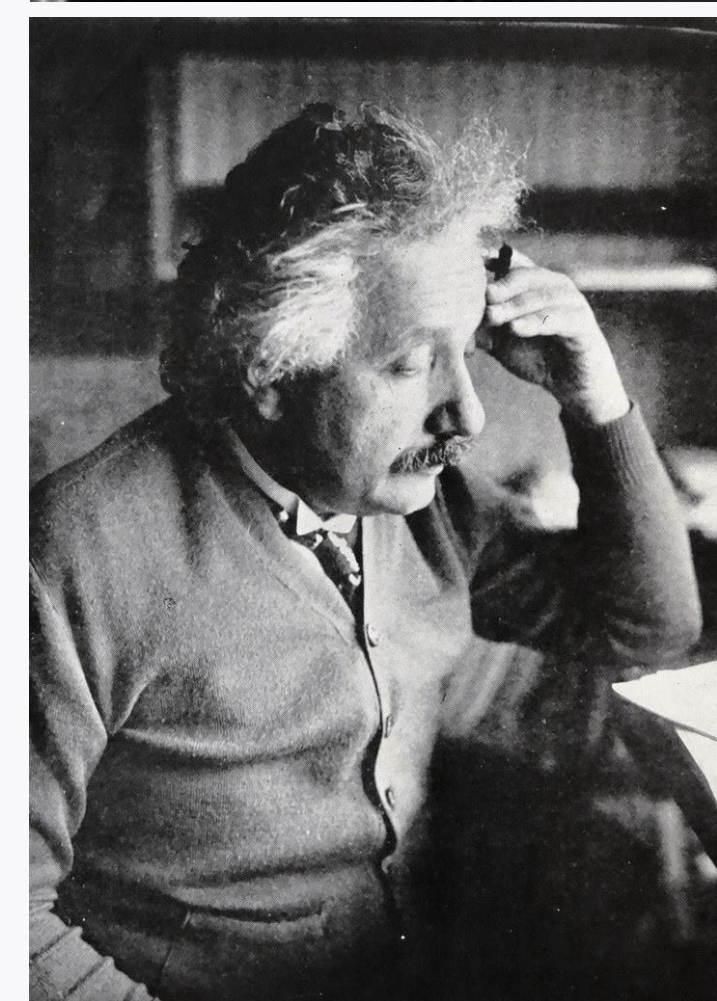
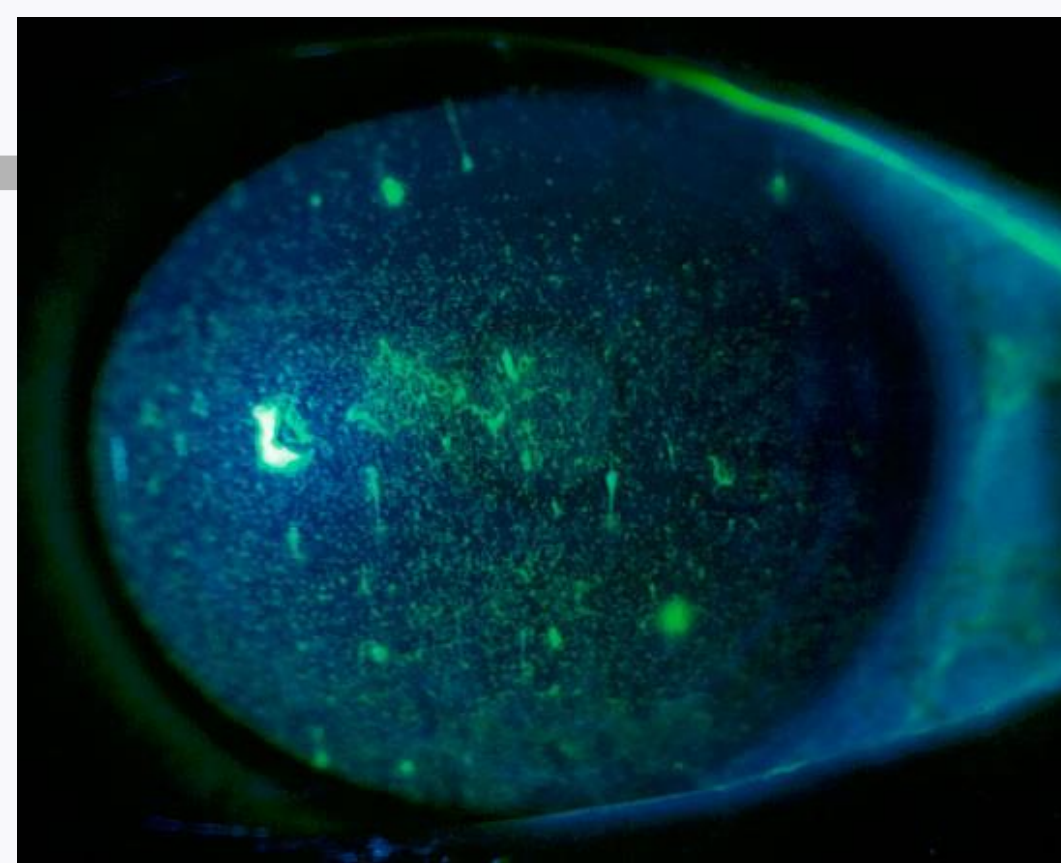
MBChB FRCOphth FRCS(Ed)

Specialist in Cornea, Cataract, Refractive Laser & Lens Surgery

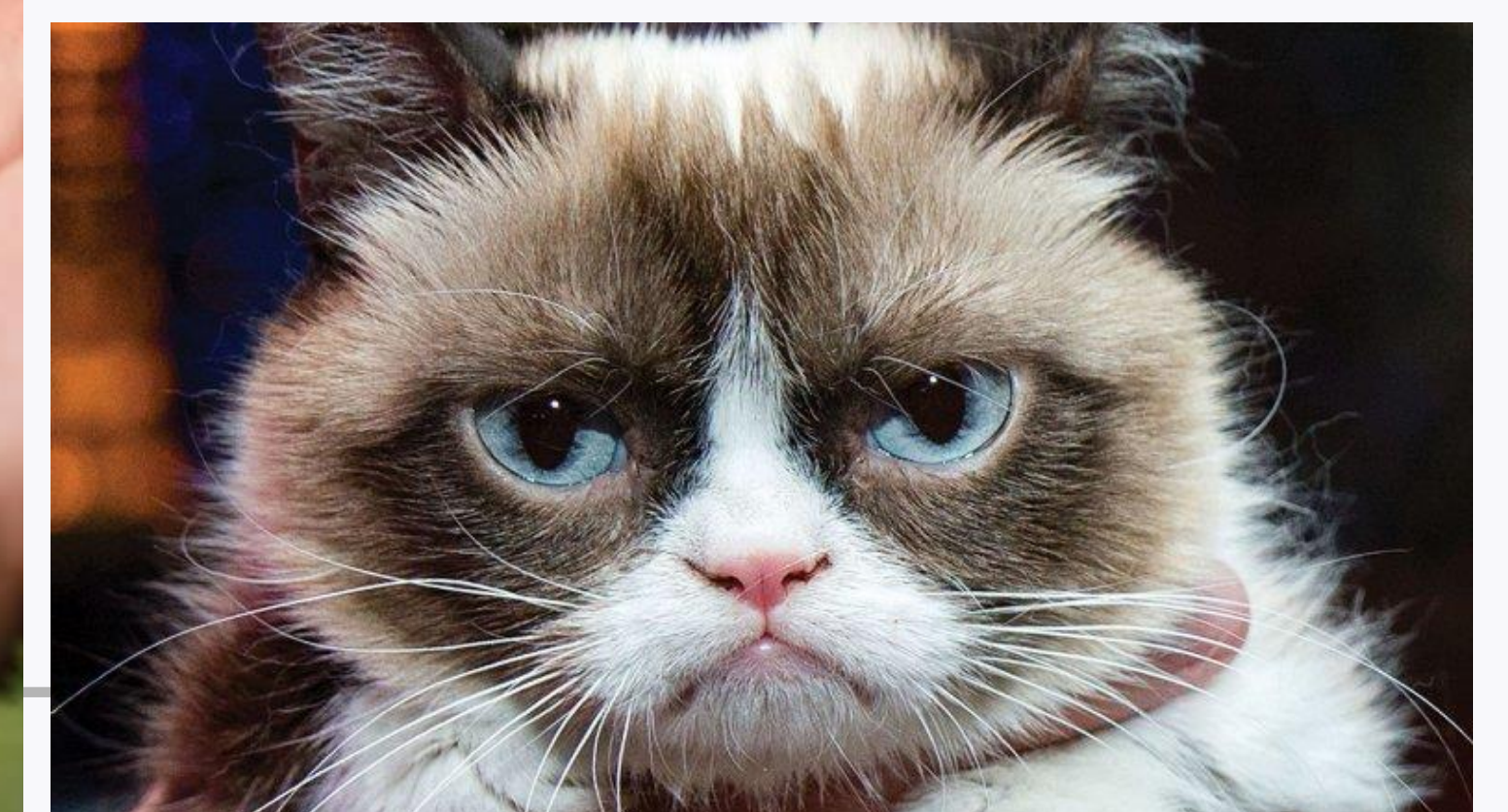
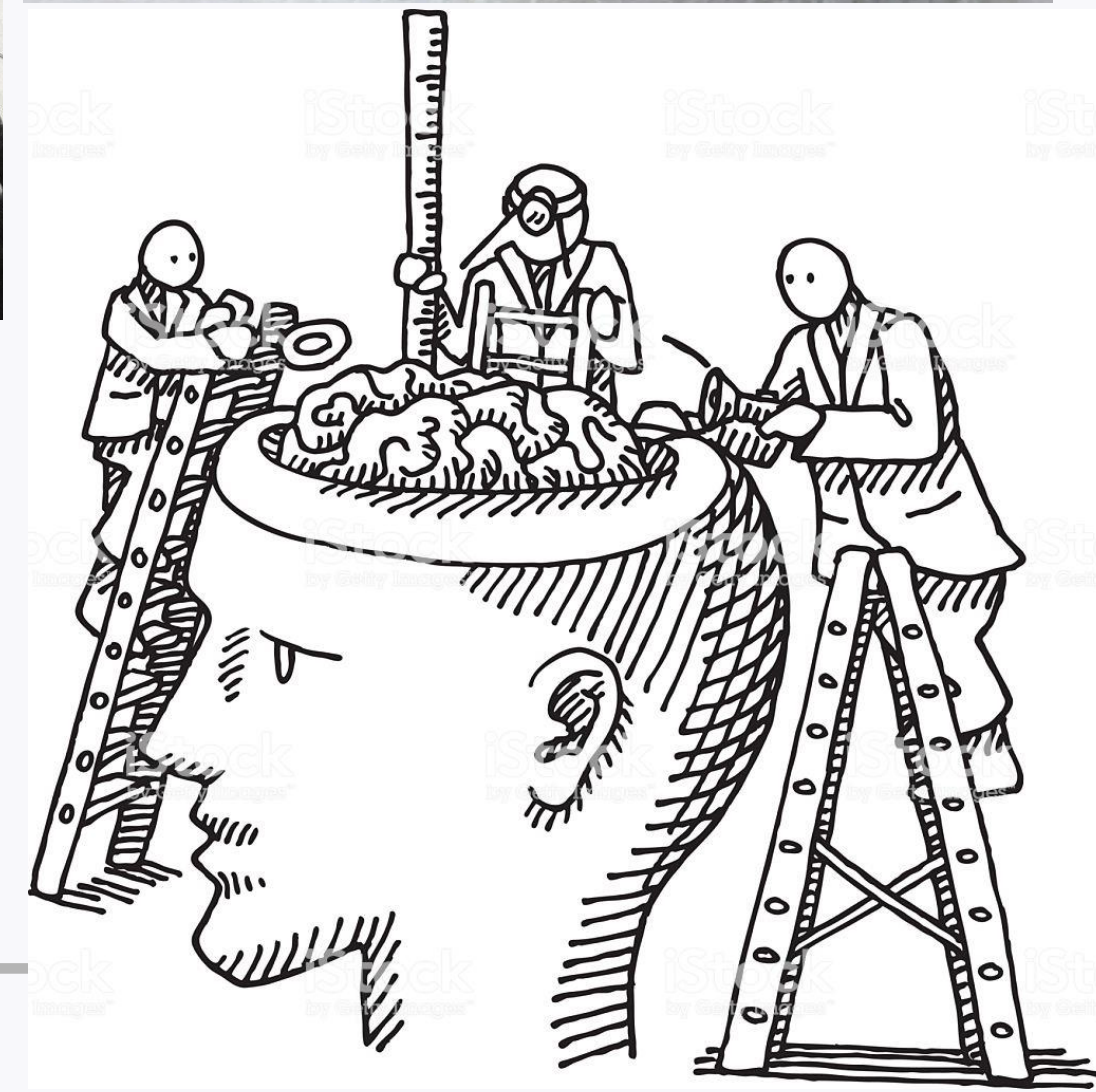


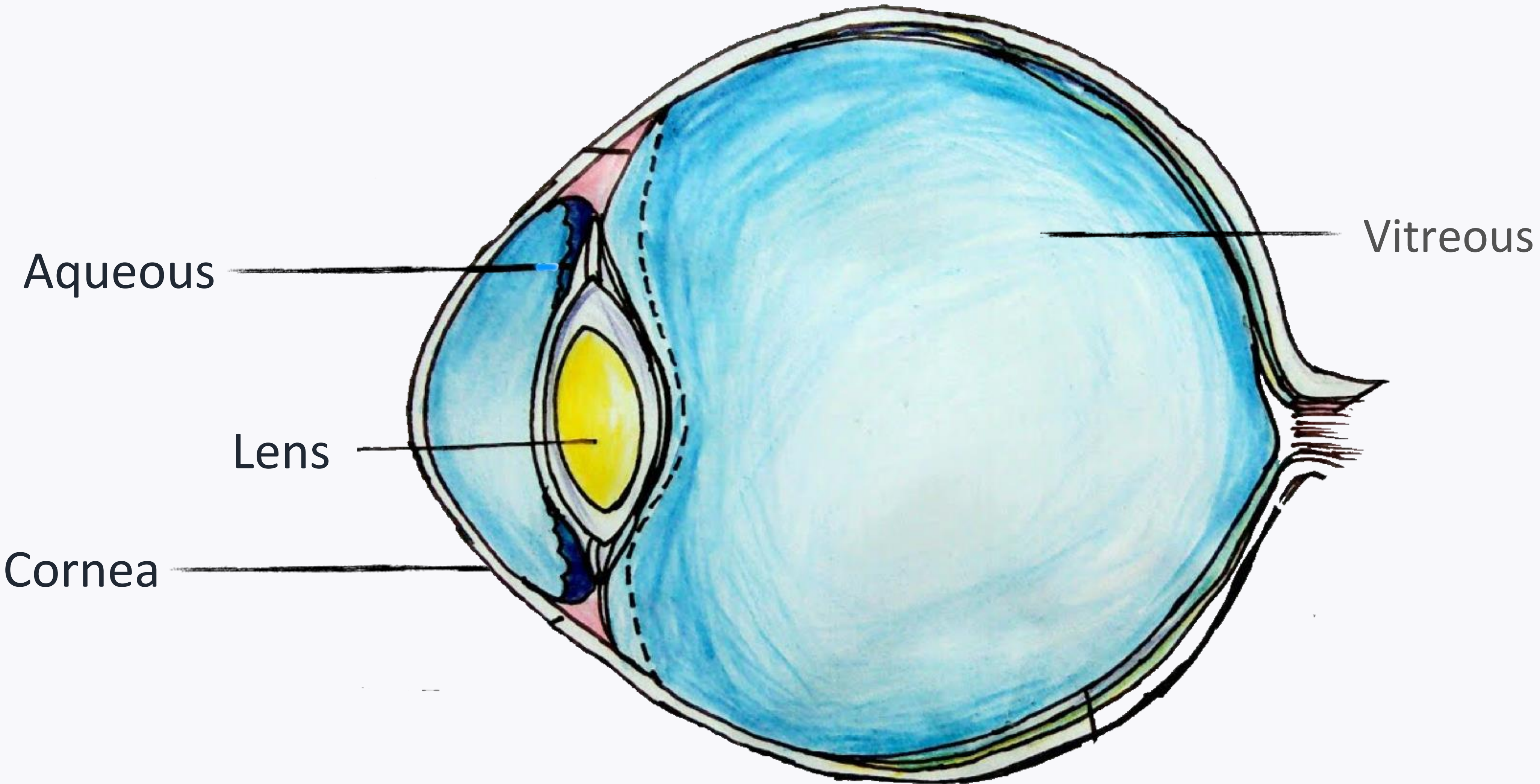
PREMIUM LENS TECHNOLOGY

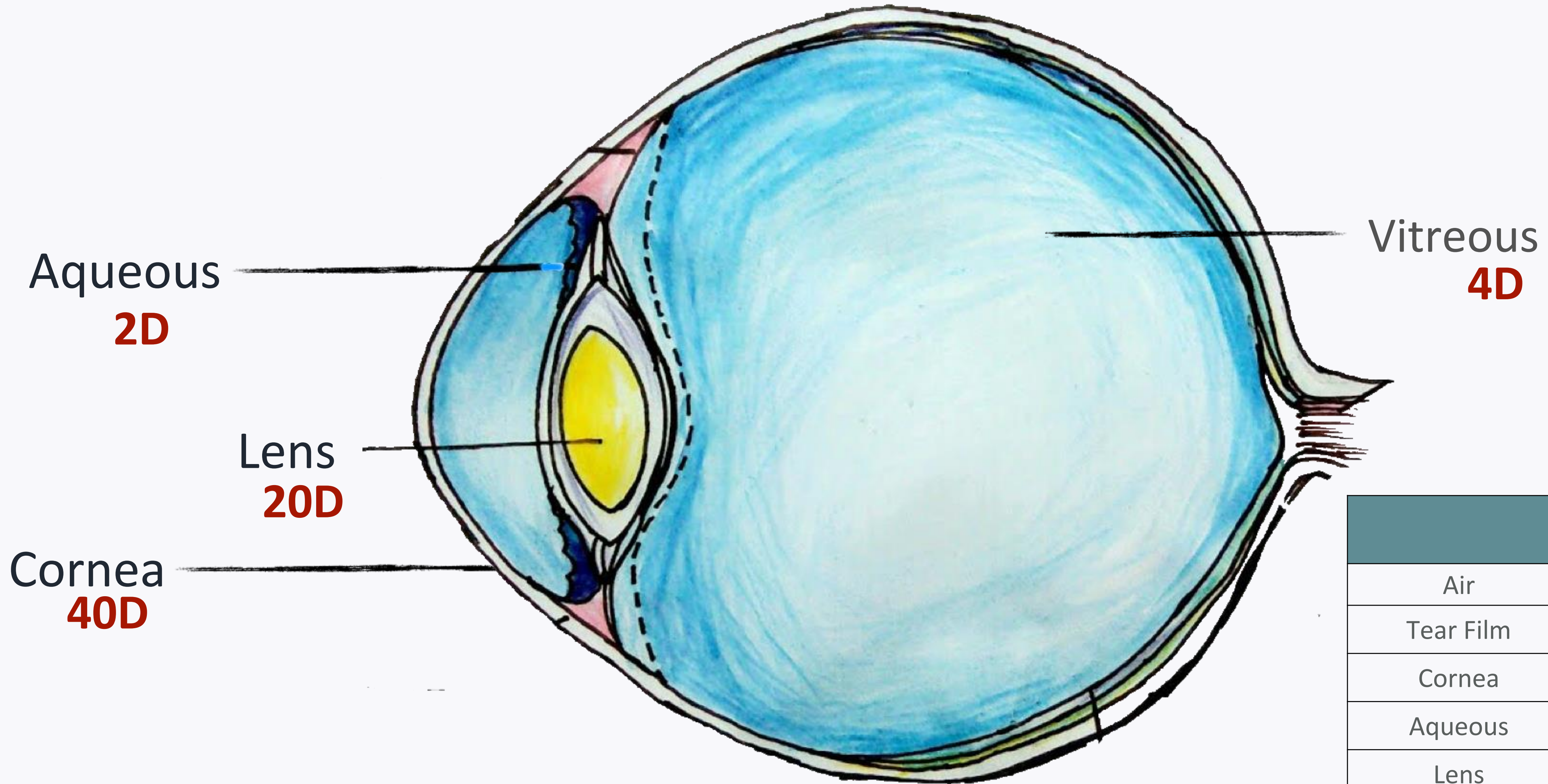




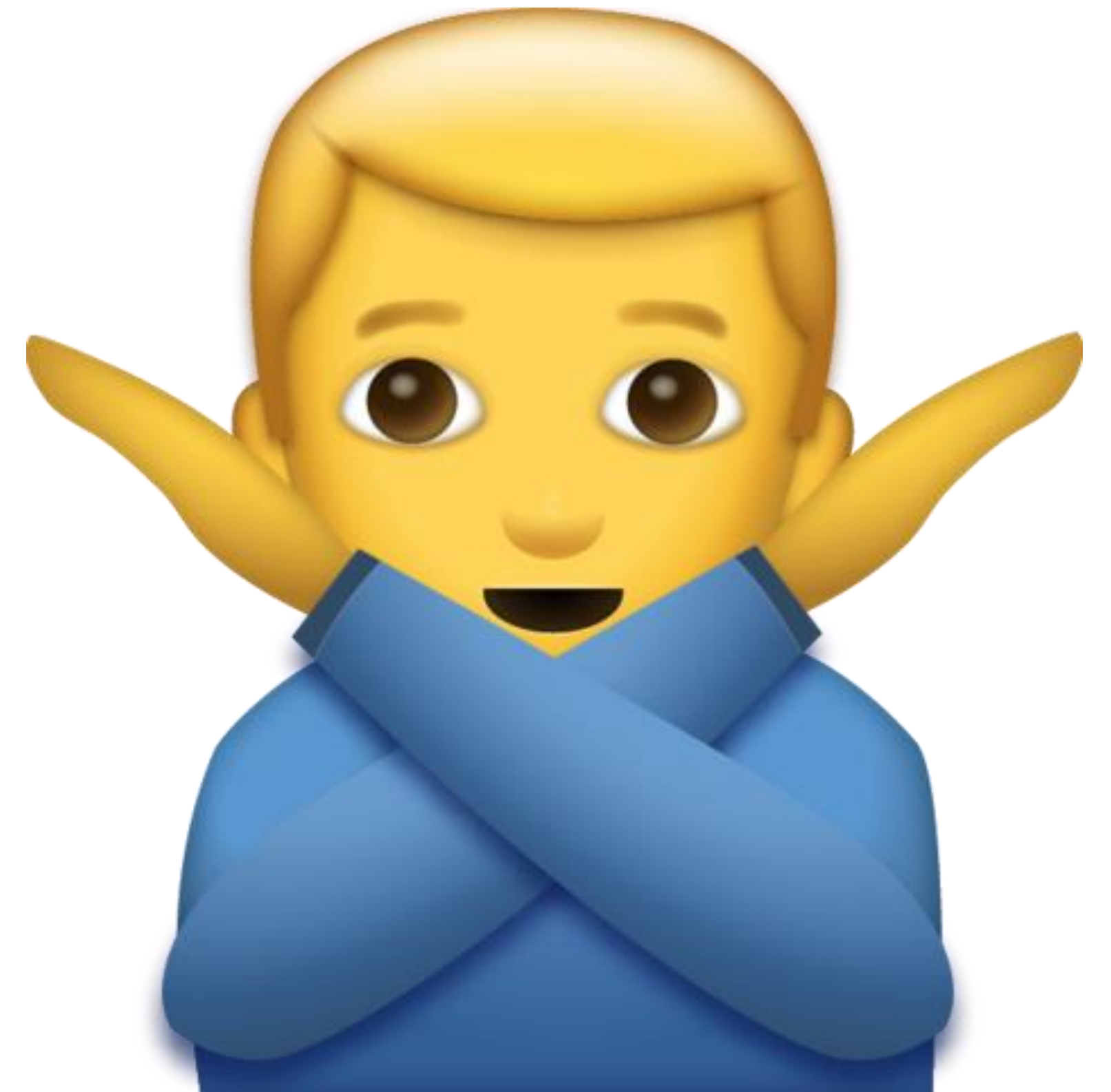
"Ever thought of seeing a meteorologist?"

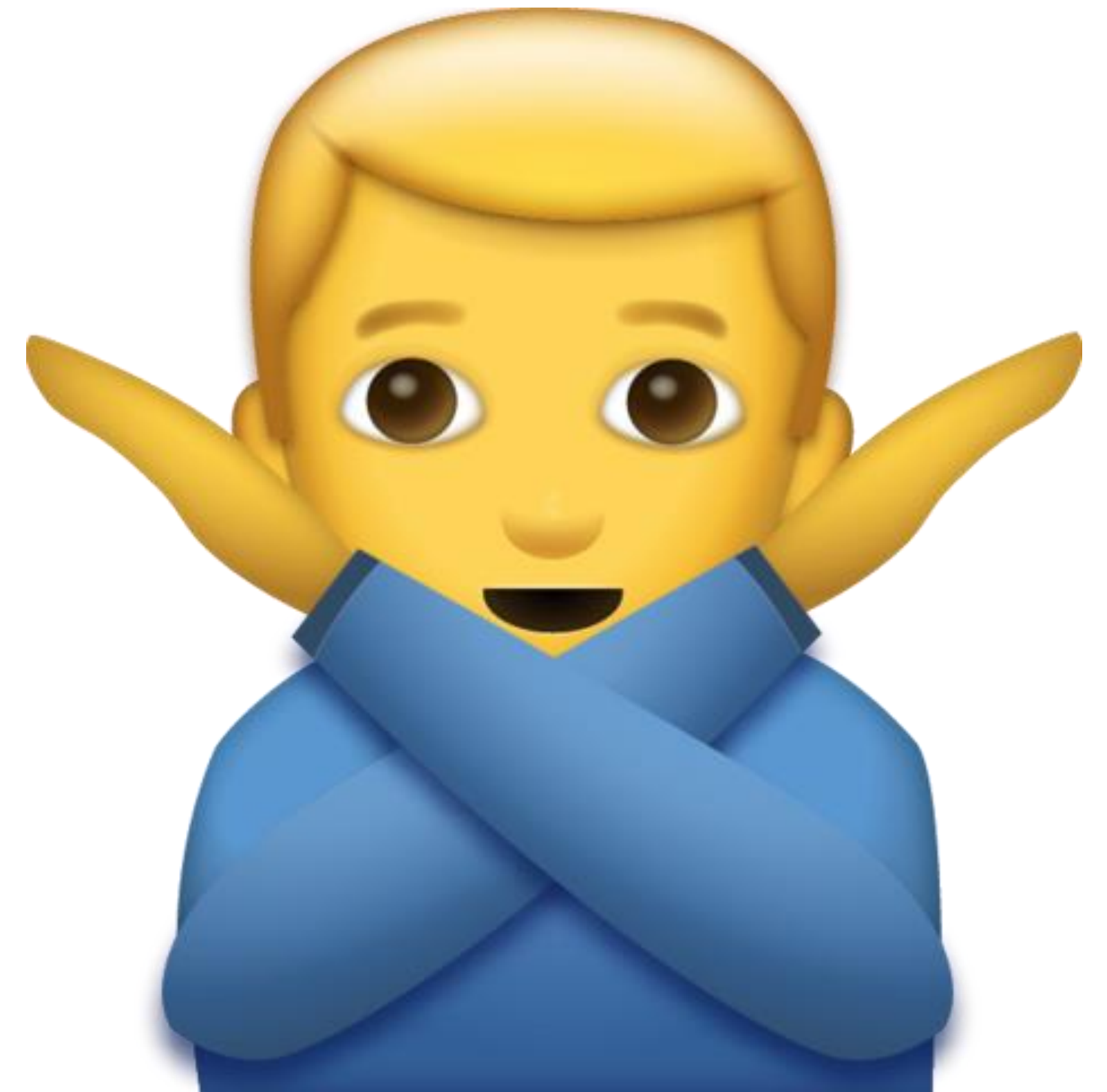
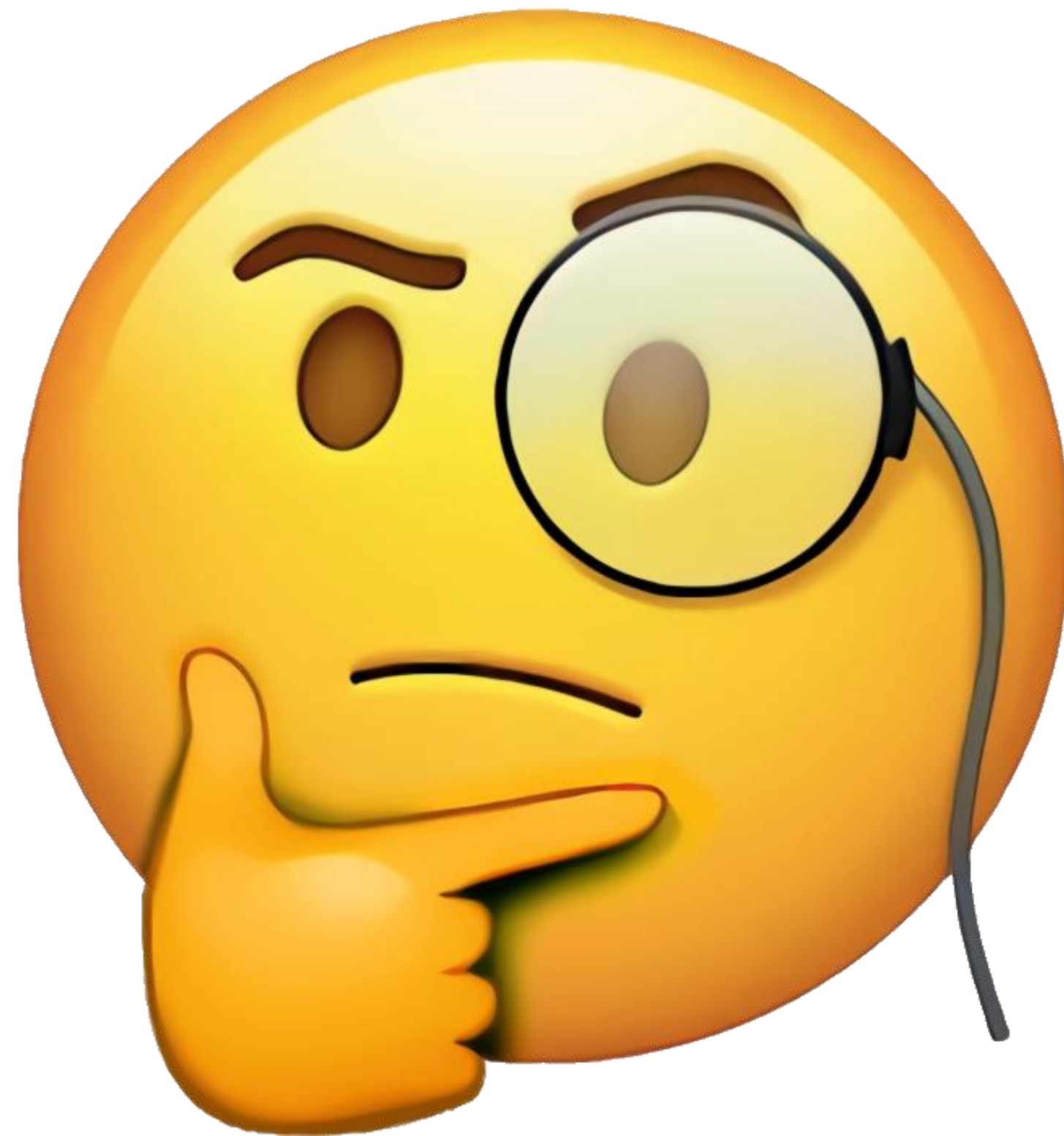


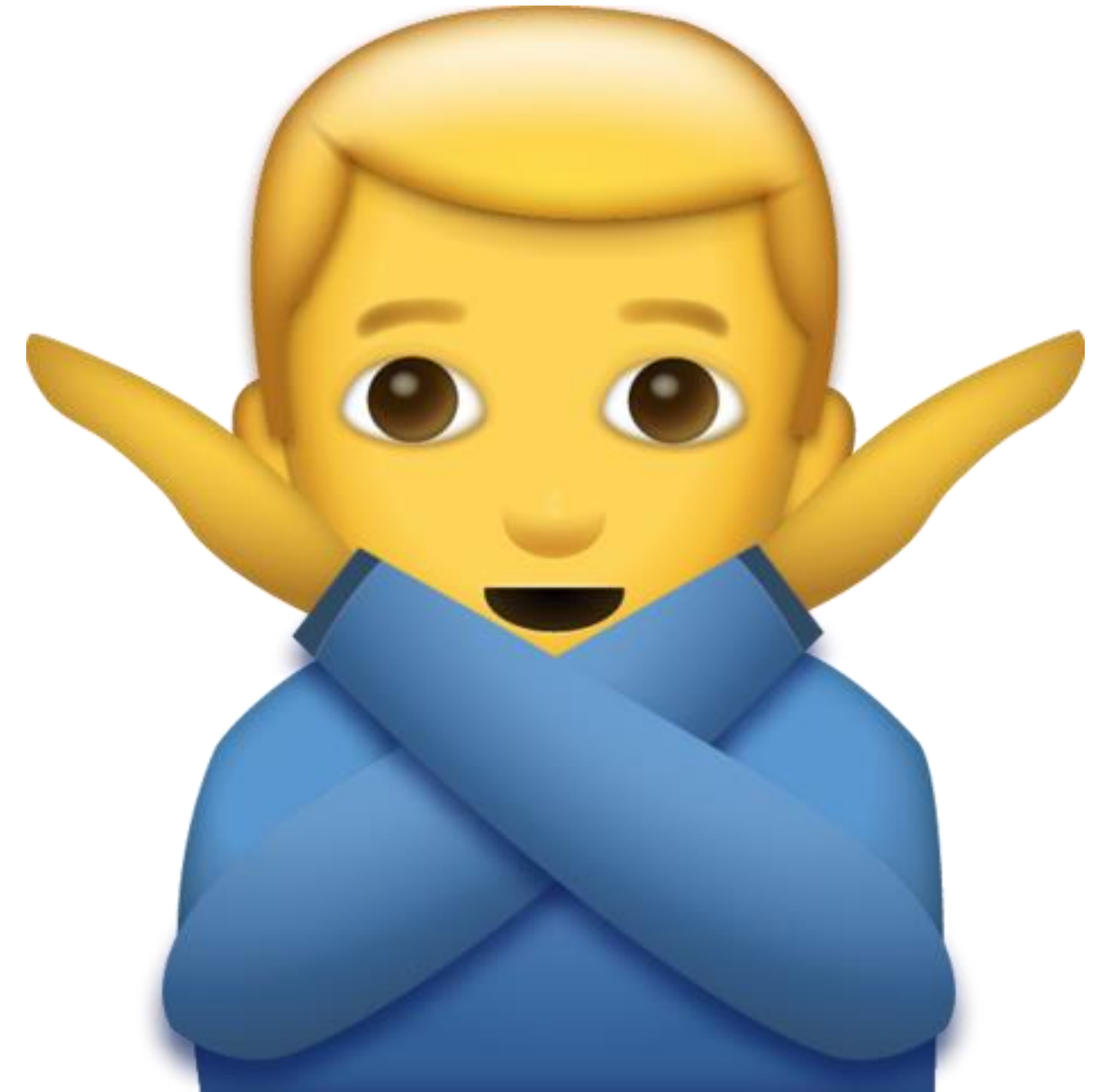
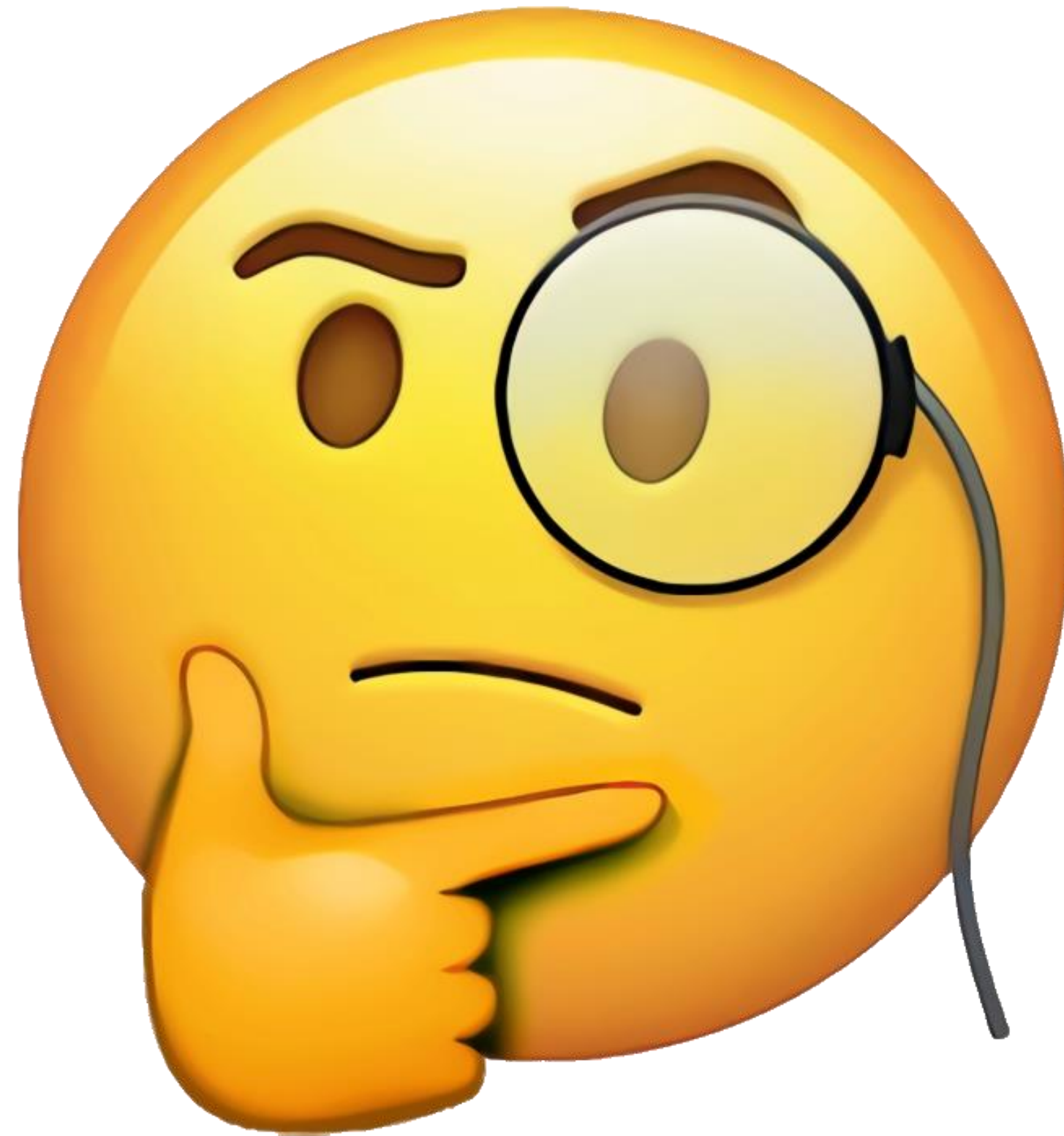




| | Refractive Index |
|-----------|------------------|
| Air | 1.00 |
| Tear Film | 1.34 |
| Cornea | 1.38 |
| Aqueous | 1.33 |
| Lens | 1.41 |
| Vitreous | 1.34 |







Option of Reversibility?

SULCOFLEX TRIFOCAL



Sulcoflex Platform

Large, 6.5mm round-edged optic to reduce the risk of pupillary block and photic effects

Large 14.0mm overall length with undulating haptics for stable fixation in the ciliary sulcus

Aberration-neutral Aspheric Optics

- Improved contrast sensitivity and functional visual acuity*

* when compared to spherical optics

Rayacryl Material for

- Exceptional uveal biocompatibility^{2,3}
- Superb optical clarity – no vacuoles or glistenings

Posterior concave surface to avoid contact with the primary IOL

Posterior haptic angulation to avoid contact with the iris and avoid iris chafe



Launched in 2007

Over 40000 lenses implanted

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Sulcoflex Aspheric (653L)



Sulcoflex Multifocal (653F)

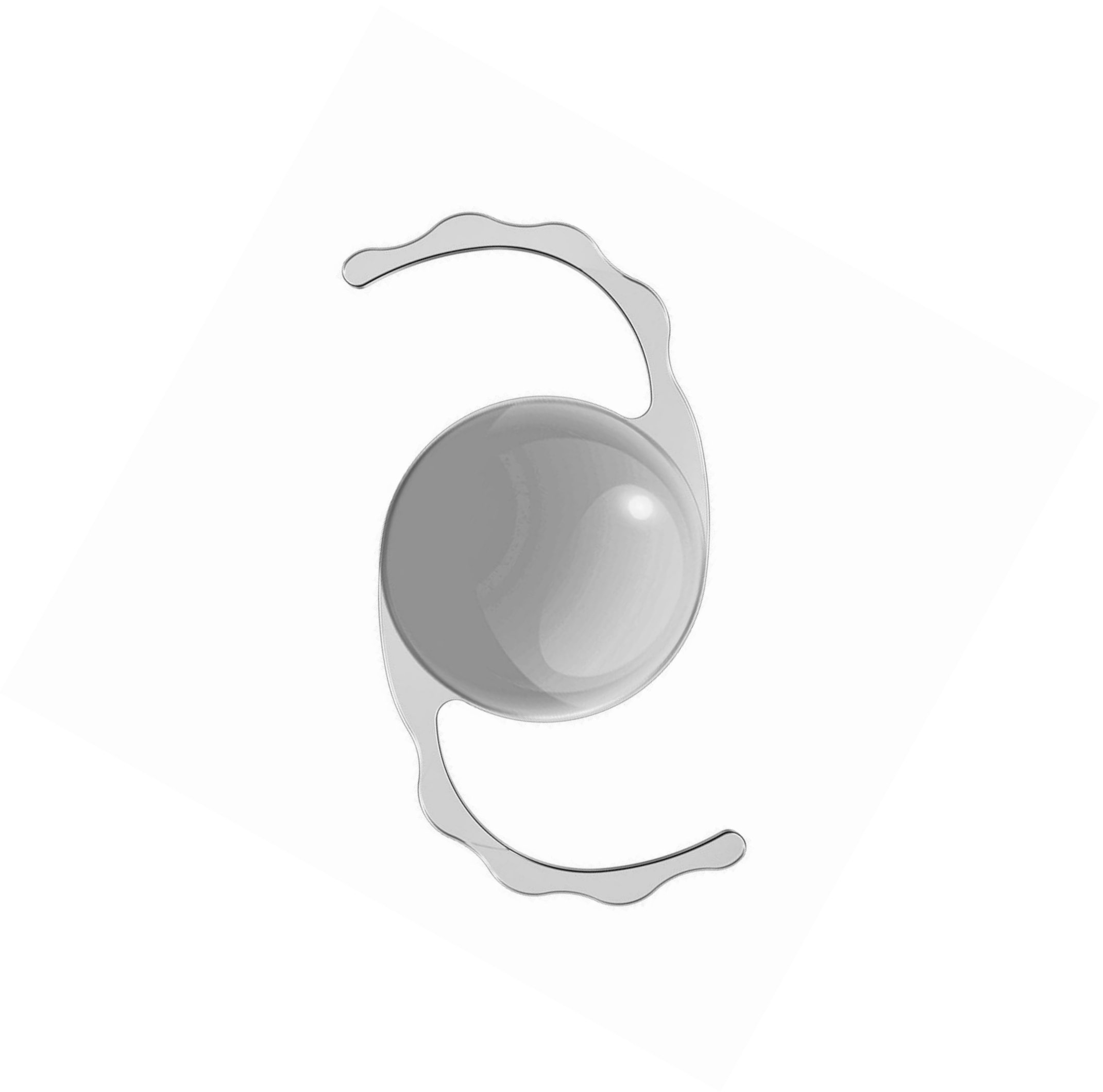


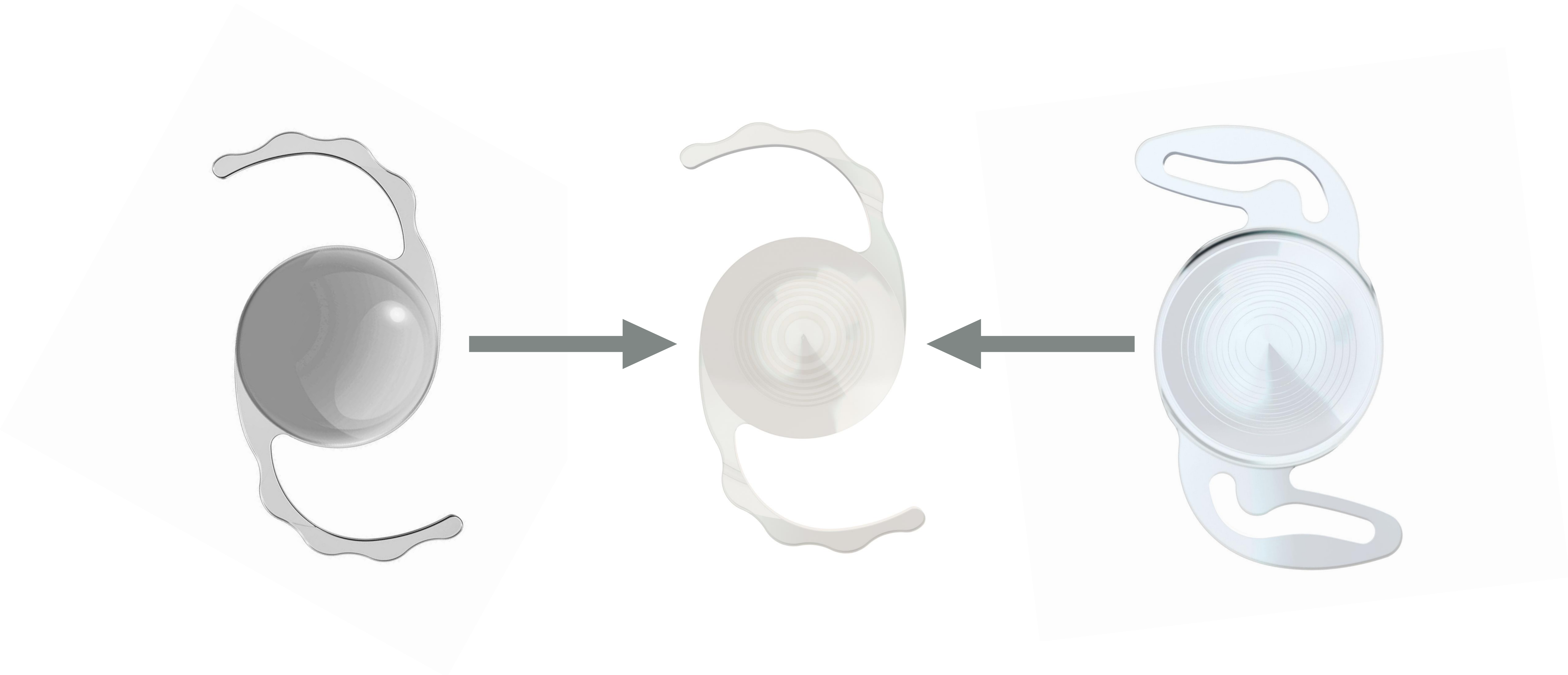
Sulcoflex Toric (653T)



Sulcoflex Multifocal Toric (653Z)





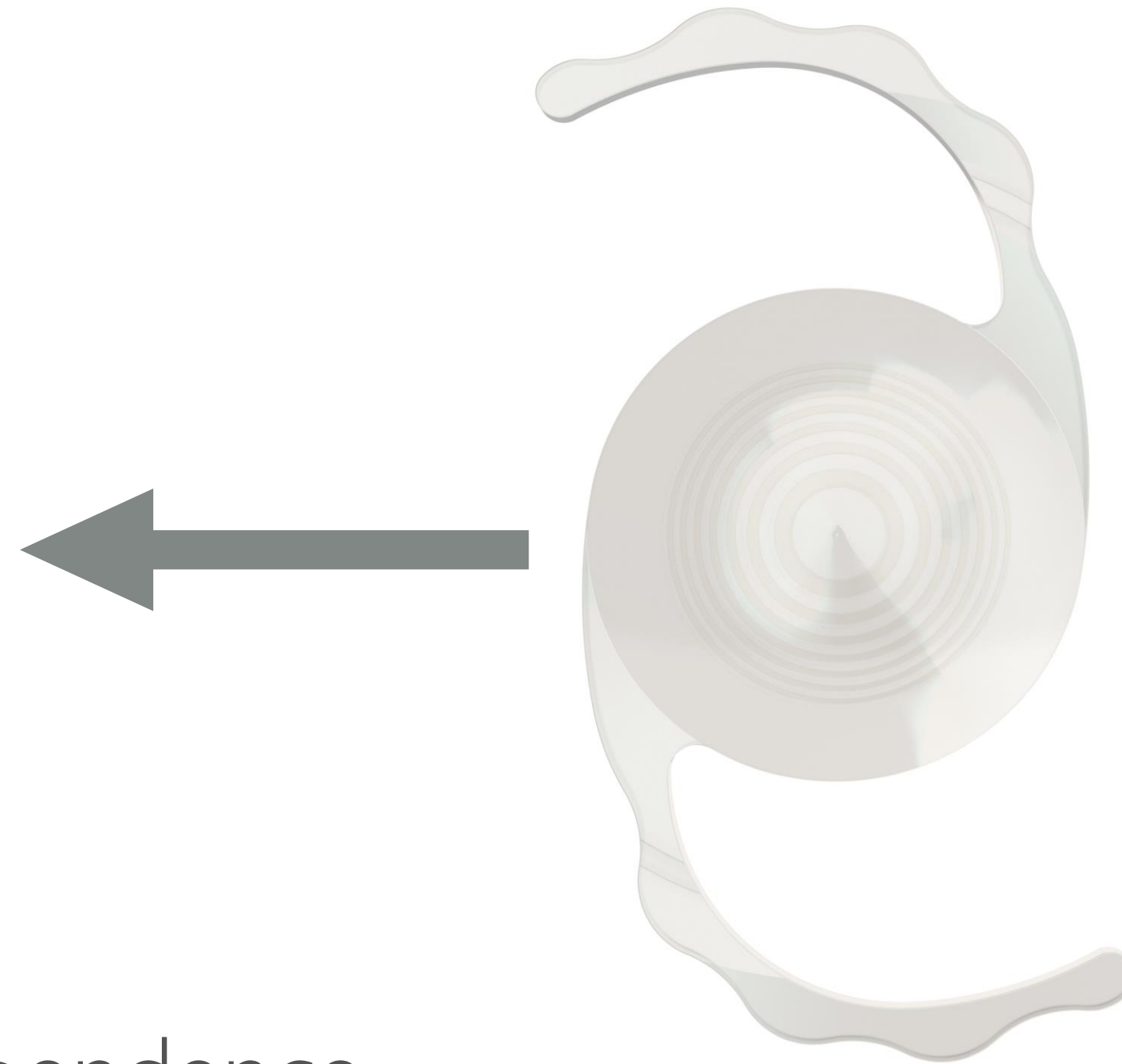




Option 1

Previous Pseudophakes

- Correct Ametropia
 - Range -3D to +3D
- Reduce Spectacle Dependence



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Option 2

Simultaneous DUET

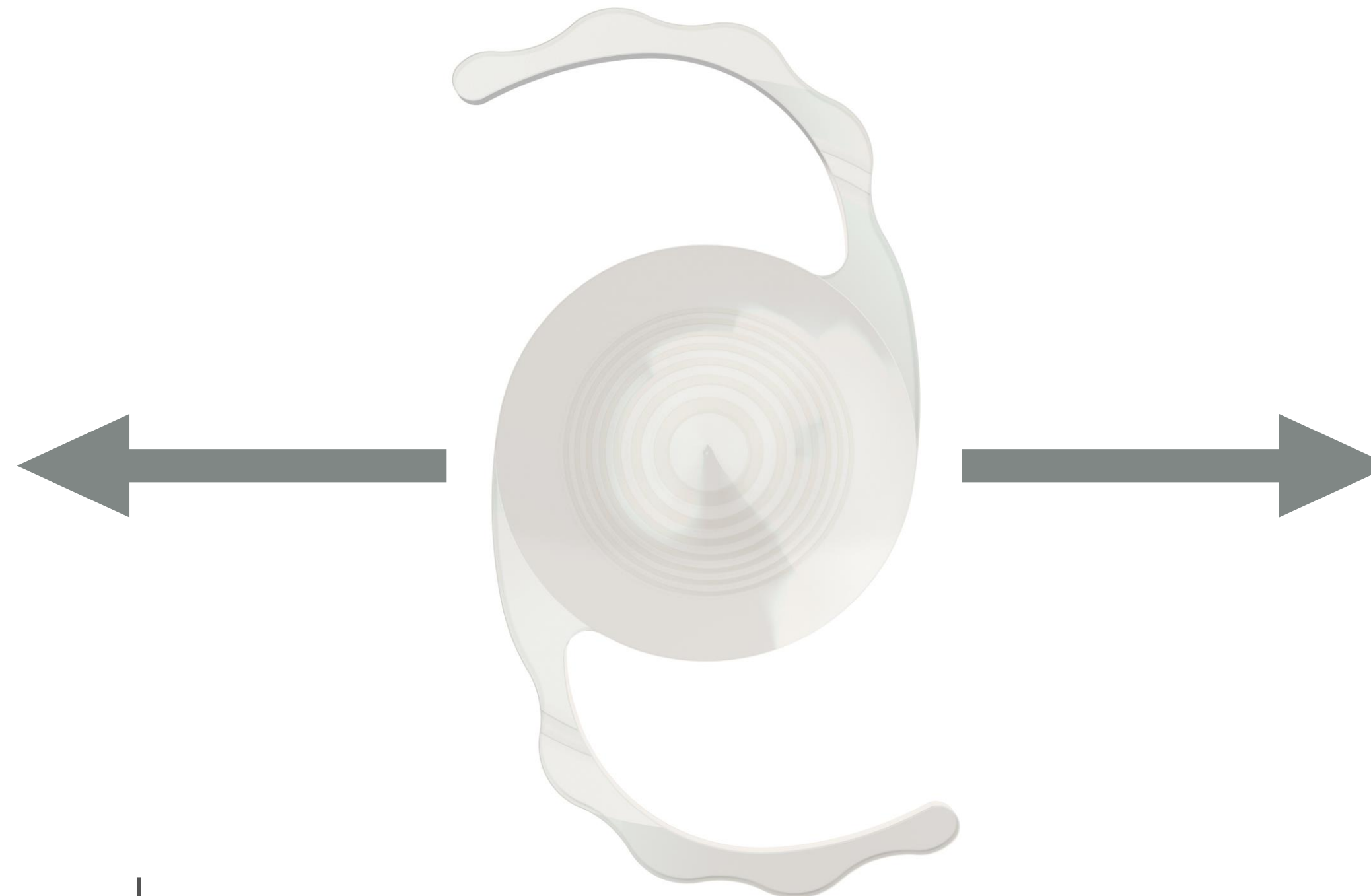
- Reversible
- Customisable
- Upgradeable

DUET

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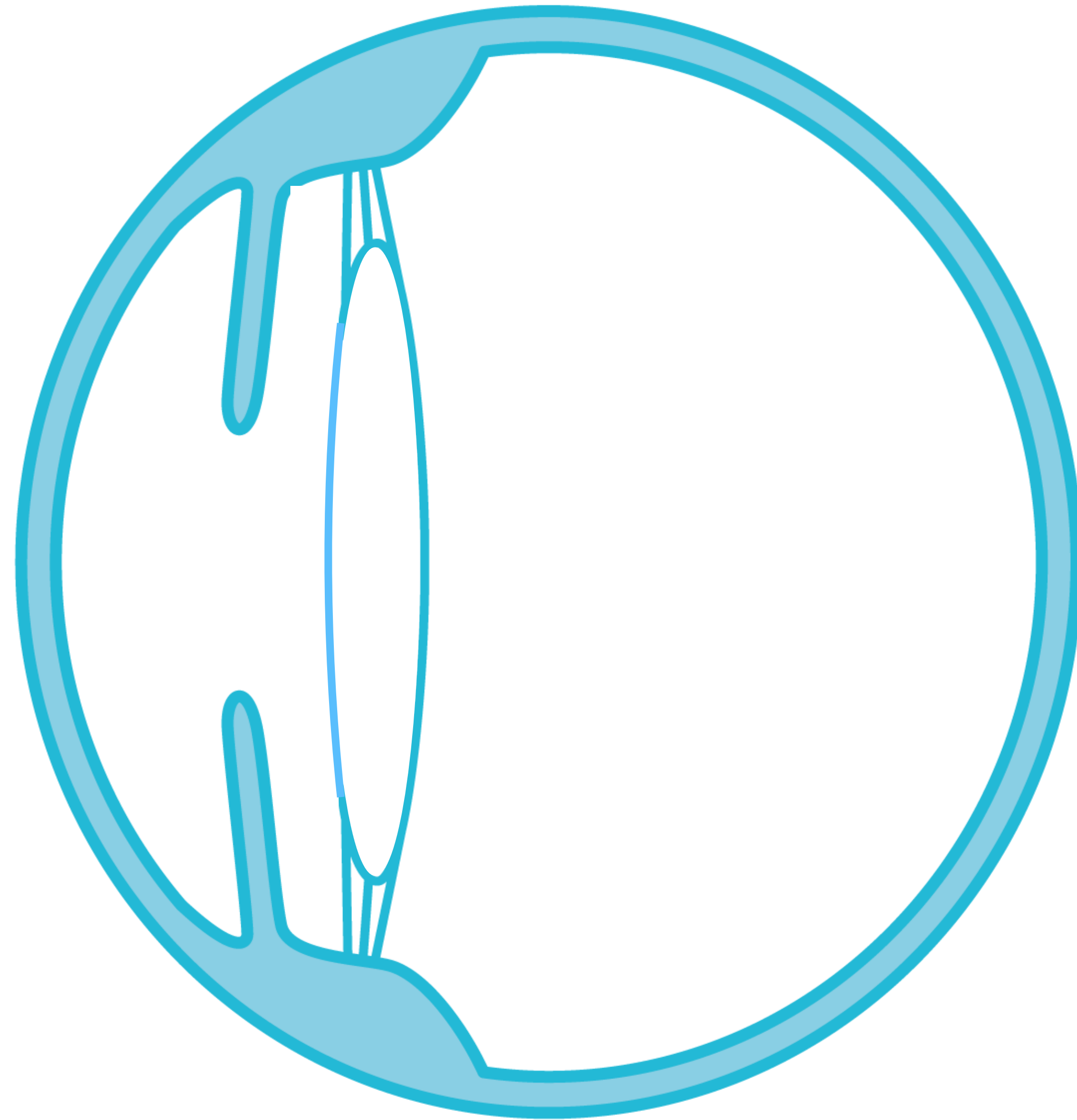


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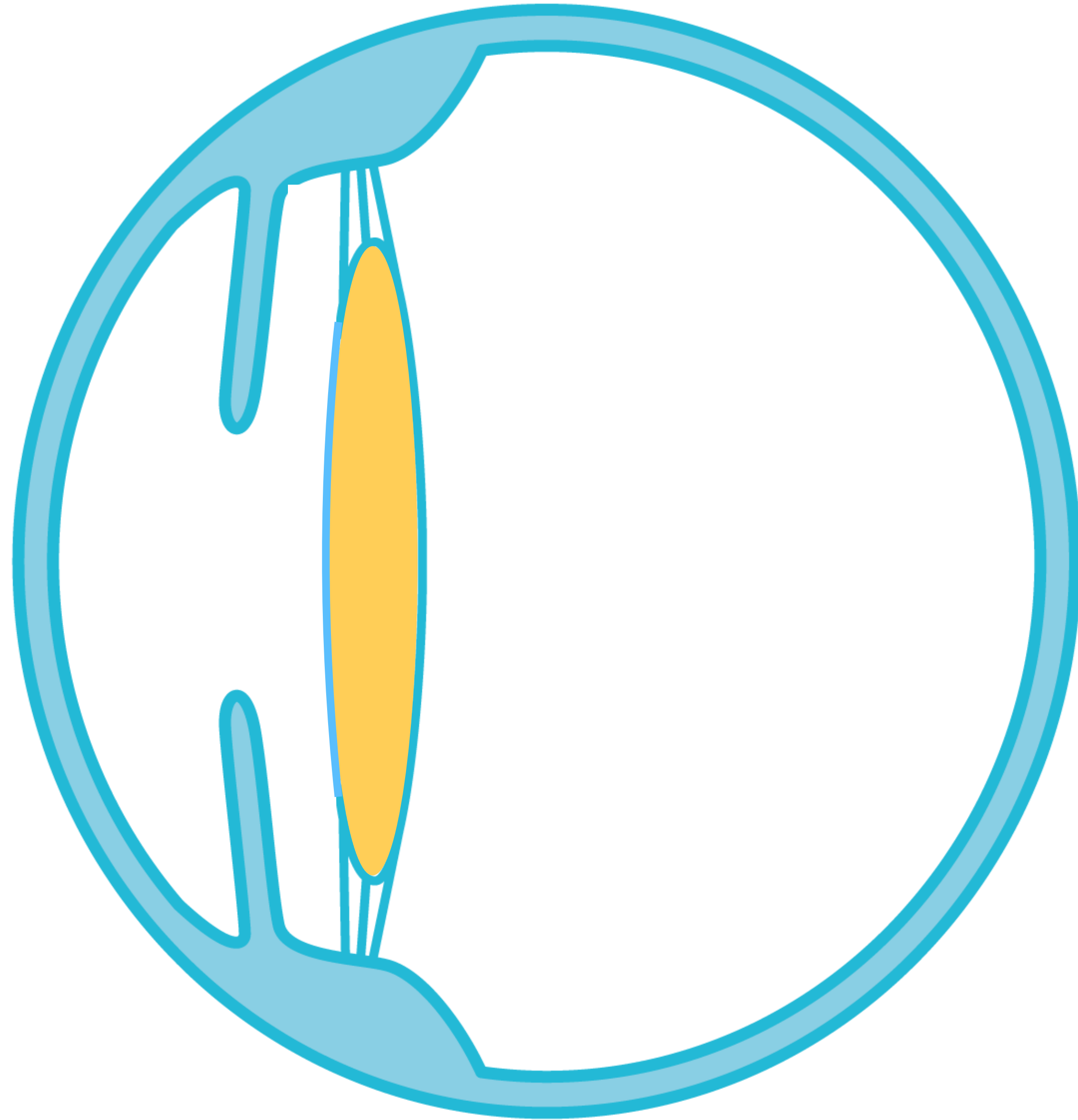
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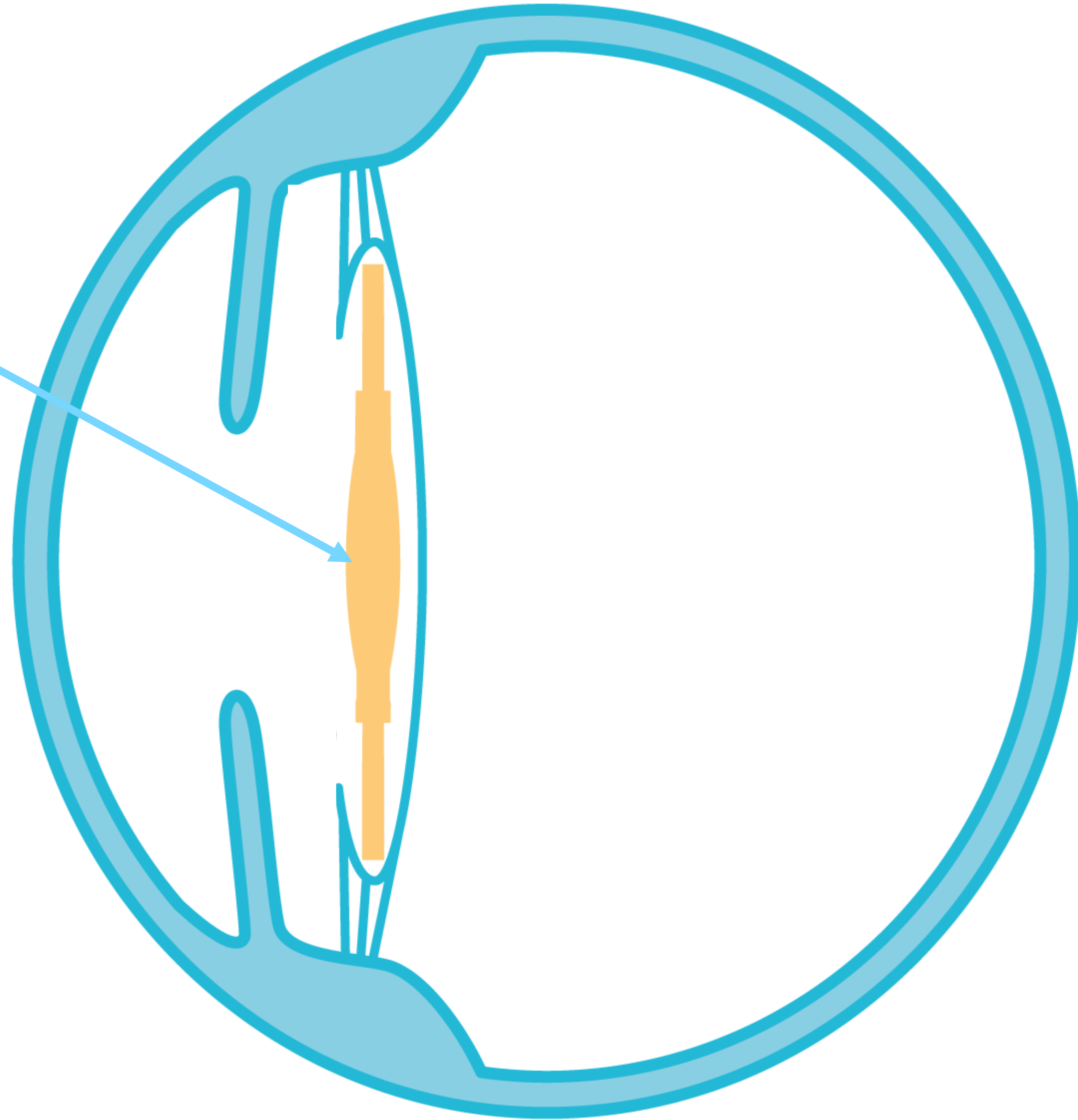
DUET



DUET



Step 1 -
Monofocal IOL Surgery



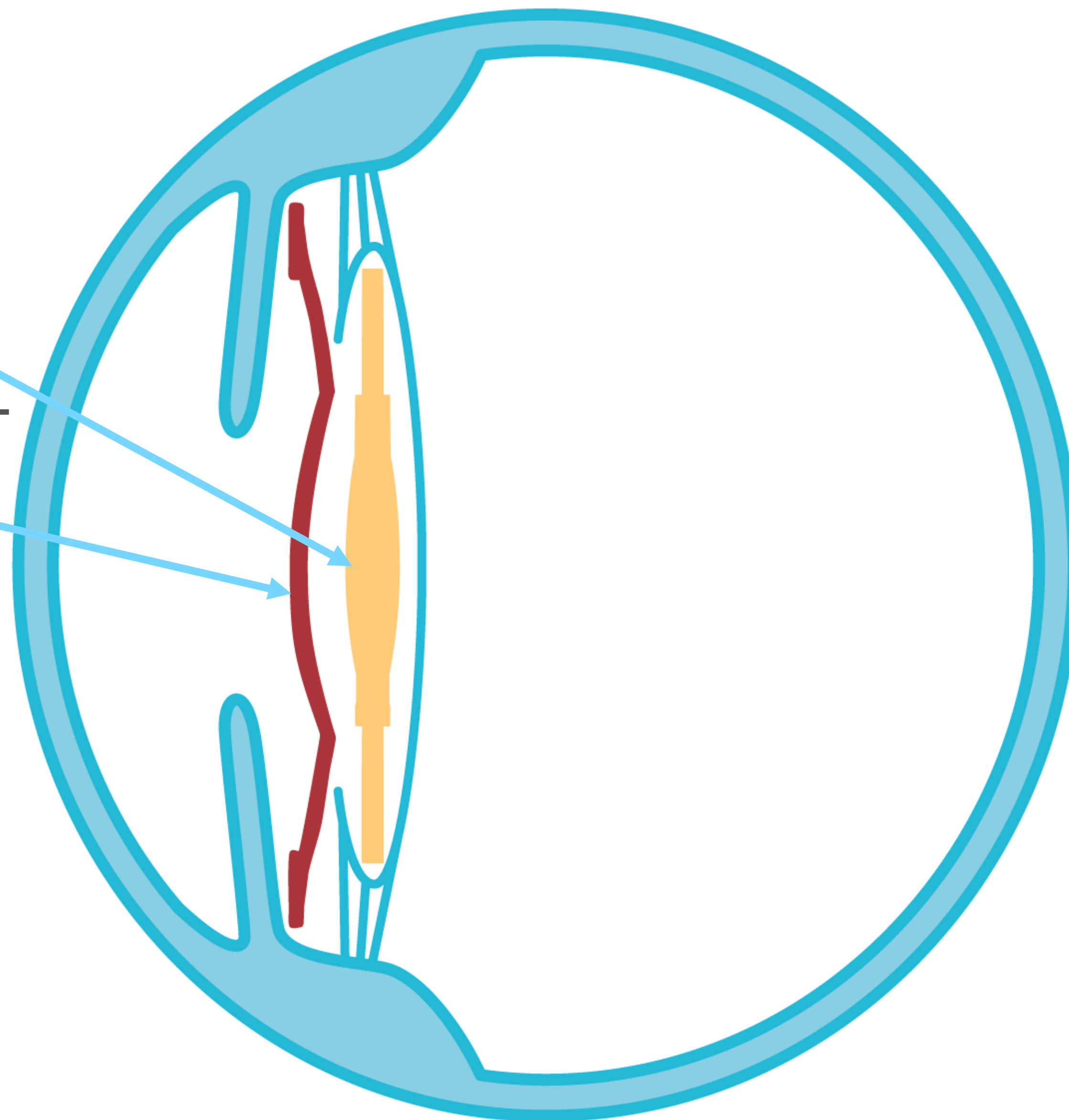
DUET



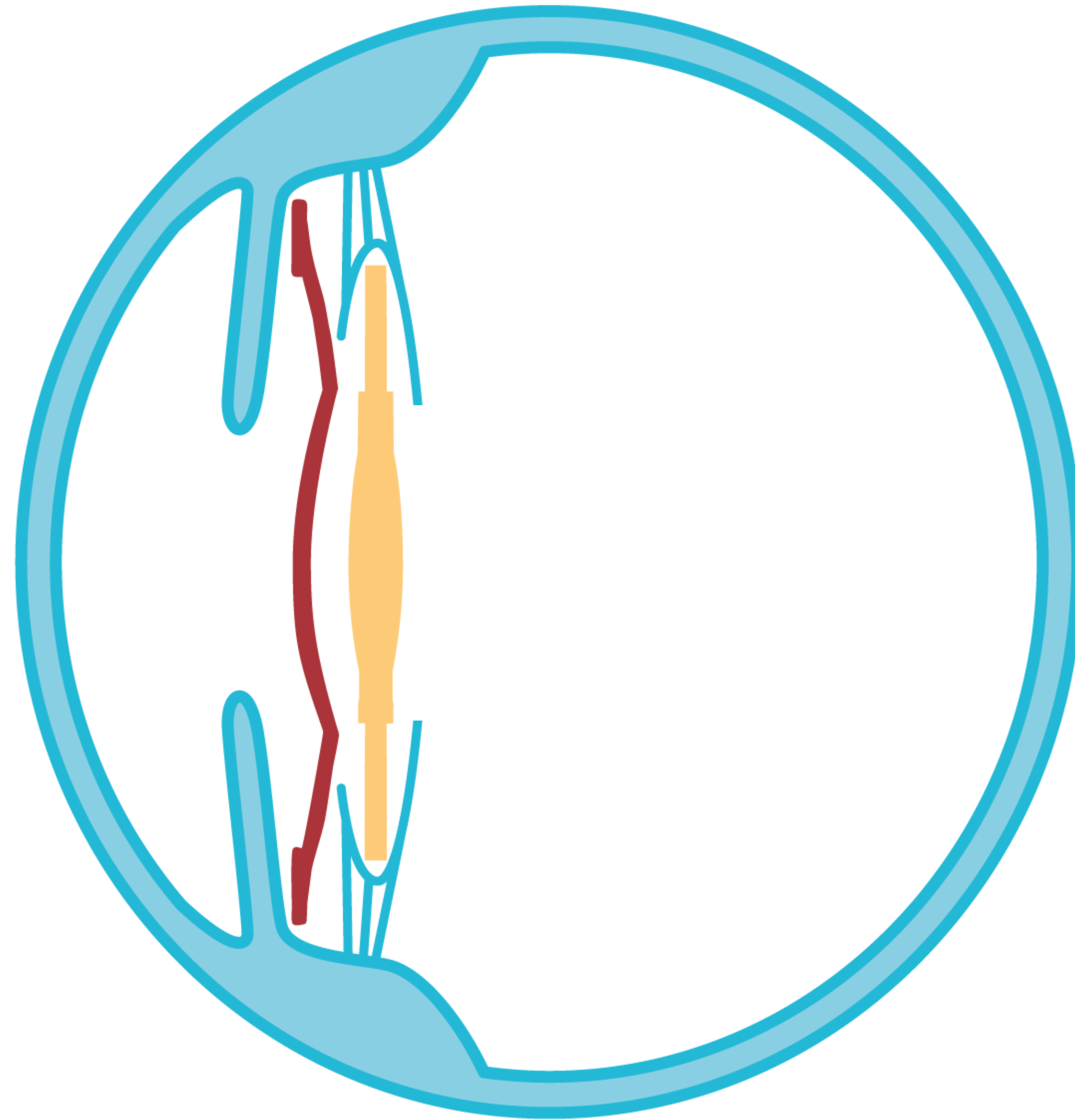
DUET

Step 1 -
Monofocal IOL Surgery

Step 1 or 2 -
Sulcoflex Trifocal DUET

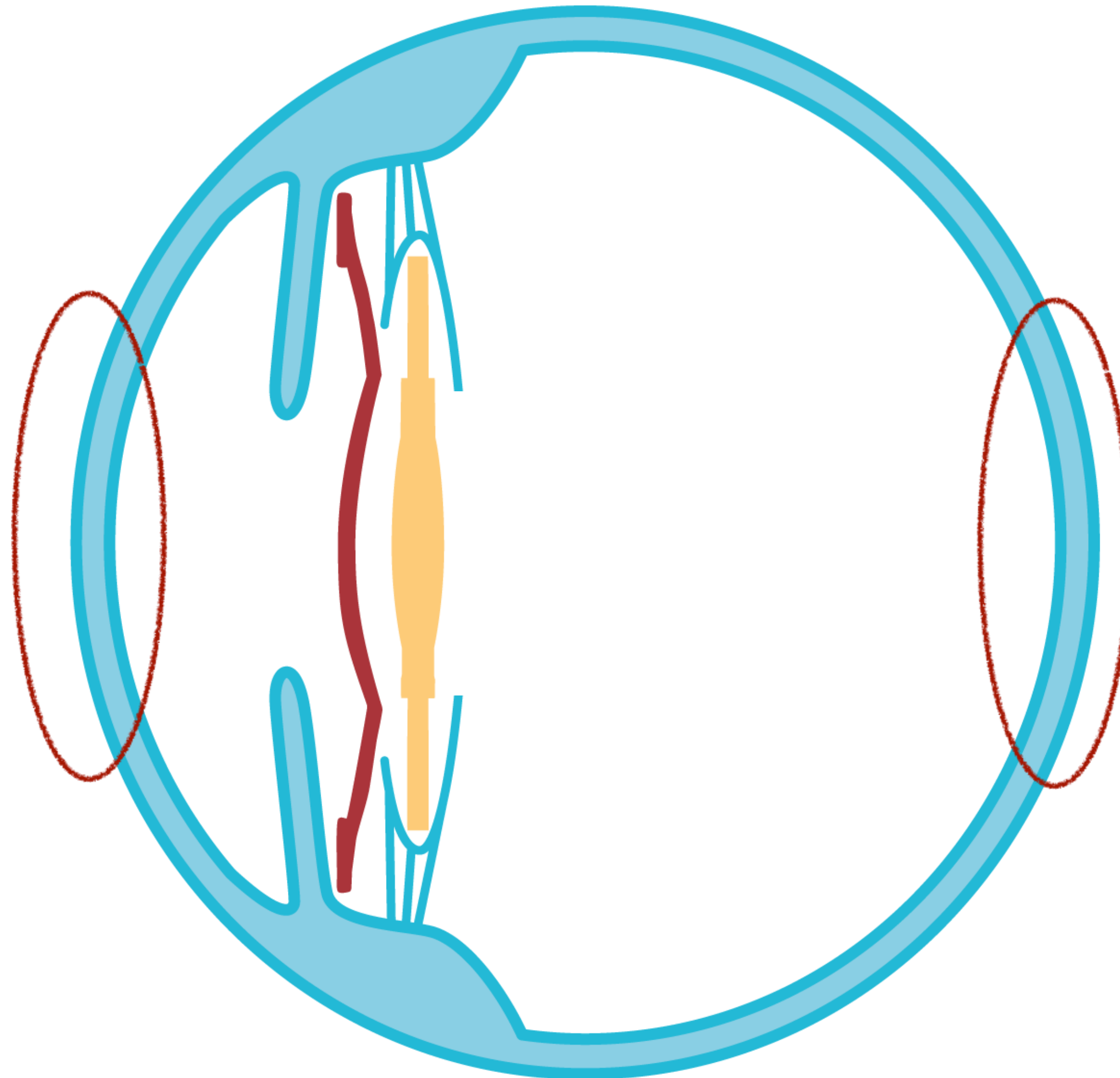


DUET



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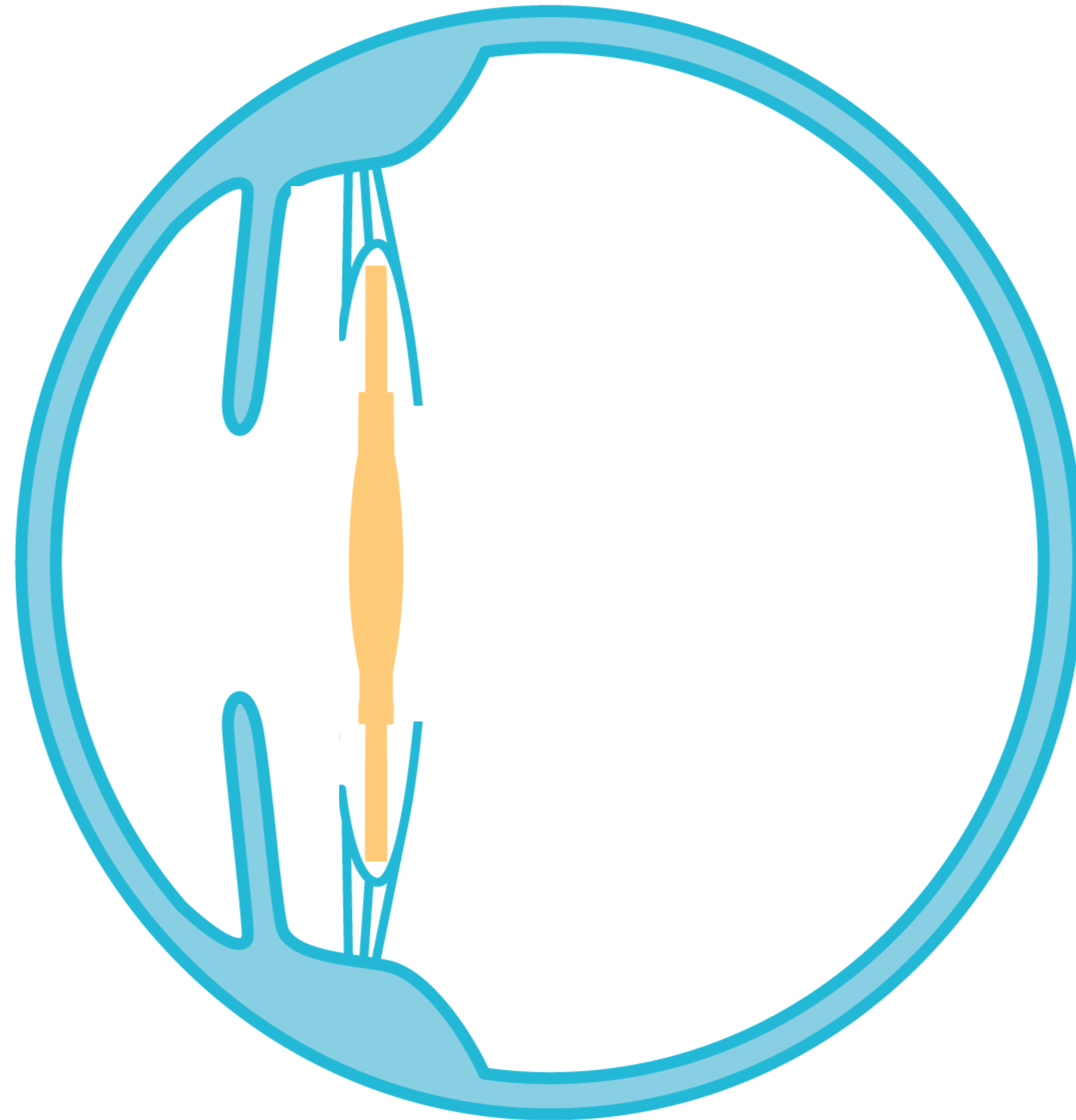
- Dry Eye
- Scarring



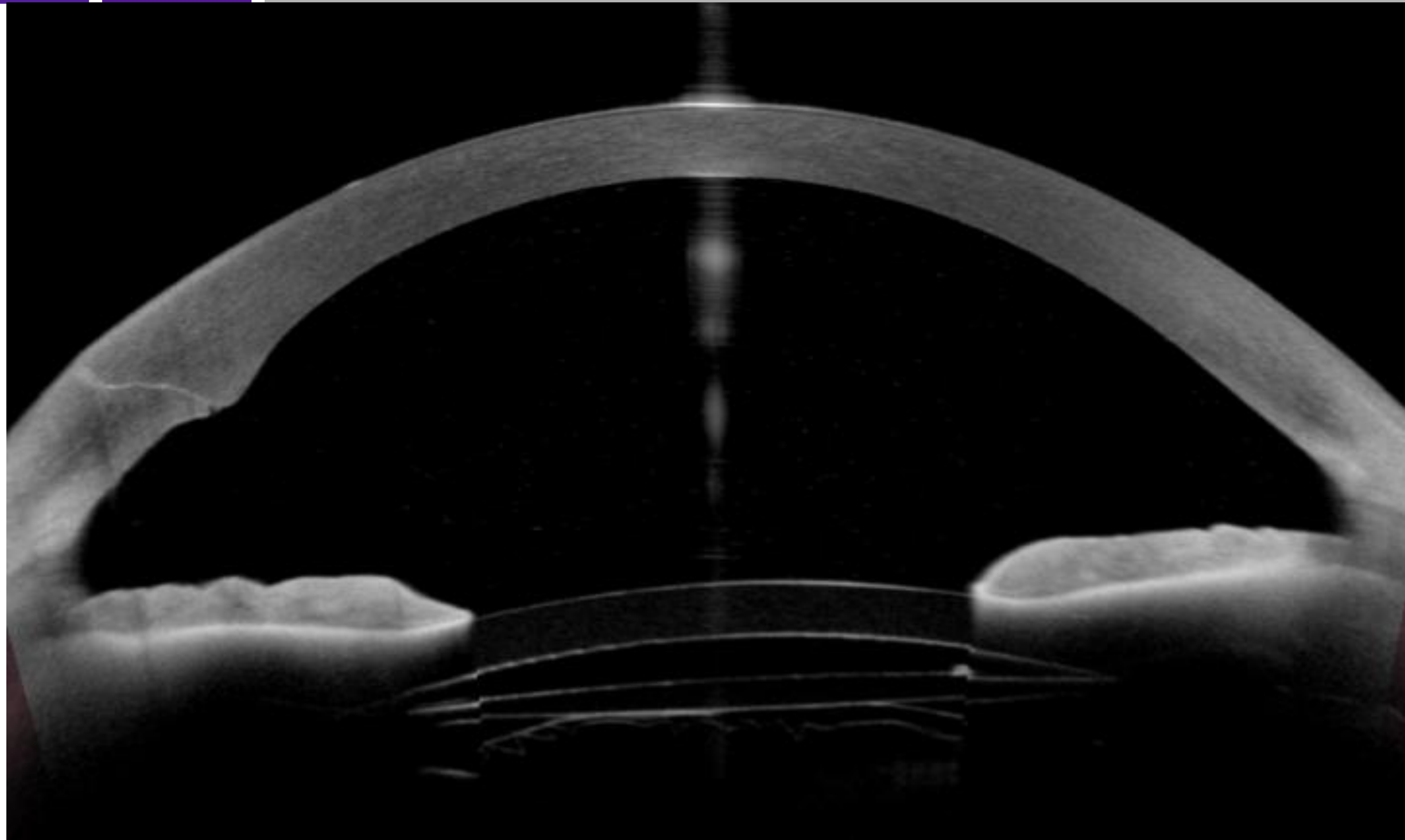
- AMD
- Retinal Membran

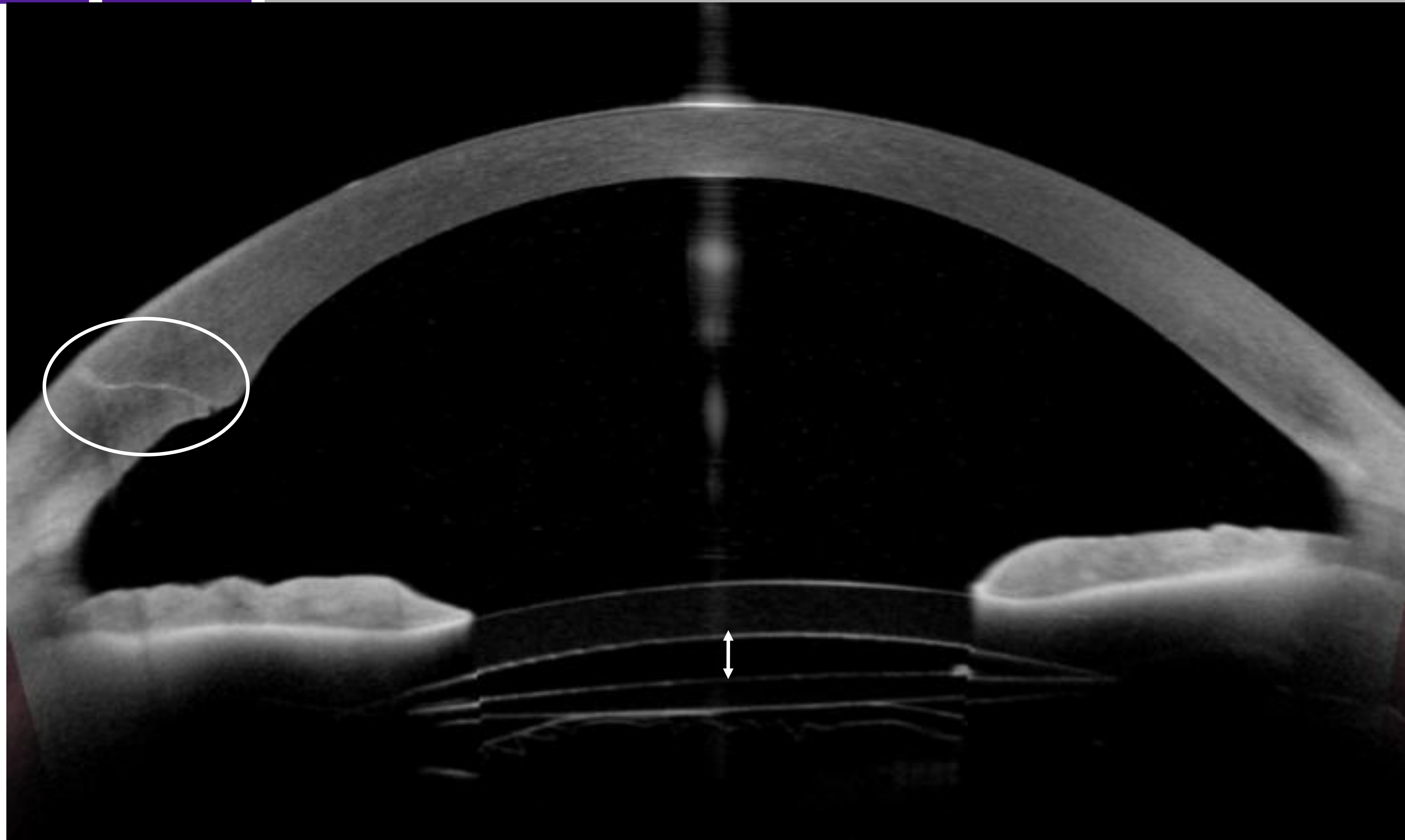


DUET



REVERSE TO
MONOFOCAL





Study design and methods

Setting

Private practice, Portsmouth, UK

Design

Retrospective Single Surgeon

Method

Patients underwent unilateral or bilateral refractive lens exchange or cataract surgery with a Hydrophobic monofocal or monofocal toric lens with a simultaneous Sulcoflex Trifocal Intra-Ocular Lens (Rayner, United Kingdom). Preoperative manifest refraction, and uncorrected visual acuity at far, intermediate, and near distances were compared with follow-up up to 10 months. Dysphotopsias, quality of vision issues and other adverse events were reported.

Results

31 eyes of 17 patients with mean age 59.5 ± 9.3 years were included. One month following surgery, average binocular UCDVA was -0.12 ± 0.26 logMAR and UCNVA was 0.08 ± 0.12 logMAR. 30 eyes achieved an intermediate visual acuity of N6. 93 % of patients achieved post-op refraction of within ± 0.5 D and 100 % within ± 0.75 D spherical equivalent. All patients experienced mild night-time halos that were non-disabling, and 8 patients developed PCO. All patients were happy with the results.

RESULTS

N=31

DISTANCE VA

| Snellen | LogMAR | No Of Eyes | Cumulative % |
|---------|--------|------------|--------------|
| 6/4 | -0.18 | 8 | 26% |
| 6/5 | -0.08 | 16 | 78% |
| 6/6 | 0.00 | 5 | 93% |
| 6/7.5 | 0.10 | 2 | 100% |
| 6/9 | 0.18 | 0 | 100% |

NEAR VA

| Roman Chart | LogMAR | No Of Patients | Cumulative % |
|-------------|--------|----------------|--------------|
| N4 | 0.10 | 12 | 38% |
| N5 | 0.20 | 14 | 84% |
| N6 | 0.30 | 5 | 100% |
| N8 | 0.10 | 0 | 100% |
| N10 | 0.18 | 0 | 100% |

COMMENTS

- 100% Spectacle Independent
- Good predictability
- Rapid adaptation
- Halos - mild
- Forgiving Optic
- 1 patient has symptoms of Coma (mild)



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RESULTS

DISTANCE VA

| Snellen | LogMAR | DUET Sulcoflex | PhysIOL | PanOPTIX | Zeiss |
|---------|--------|----------------|---------|----------|-------|
| 6/4 | -0.18 | 26% | 13% | 14% | - |
| 6/5 | -0.08 | 52% | 44% | 14% | - |
| 6/6 | 0.00 | 16% | 31% | 54% | - |
| 6/7.5 | 0.10 | 6% | 12% | 14% | - |
| 6/9 | 0.18 | 0% | 0% | 6% | - |



RESULTS

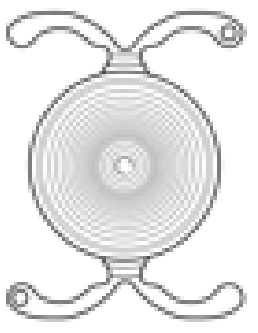
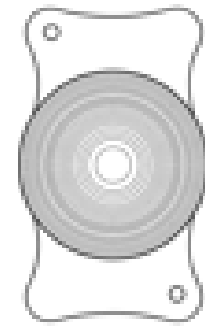
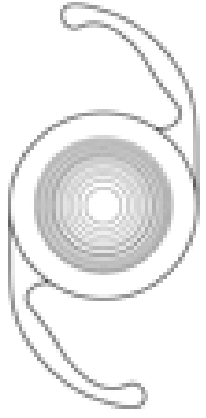
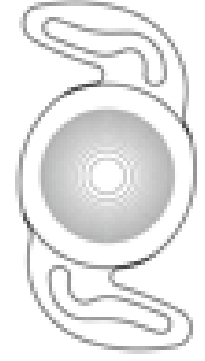
DISTANCE VA

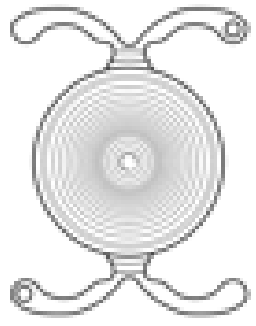
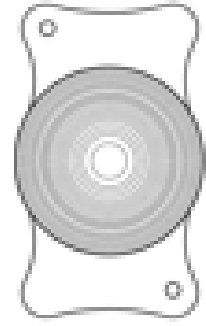
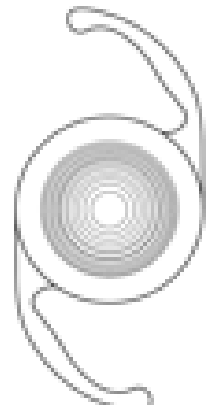
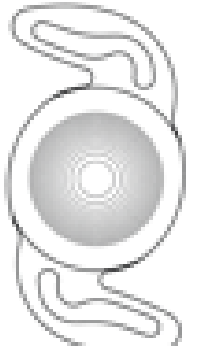
| Snellen | LogMAR | DUET Sulcoflex | PhysIOL | PanOPTIX | Zeiss |
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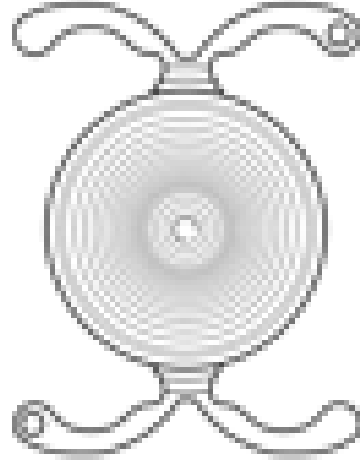
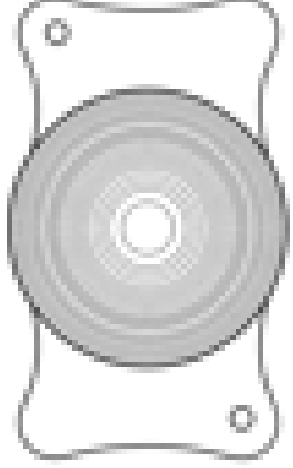
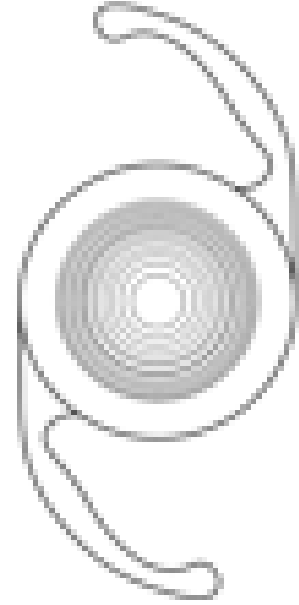
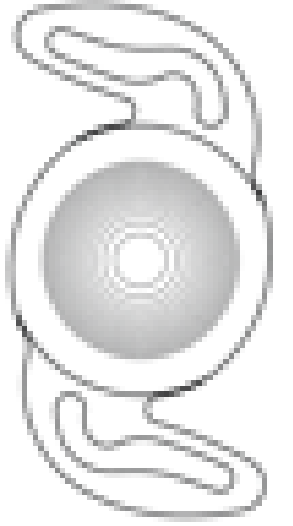


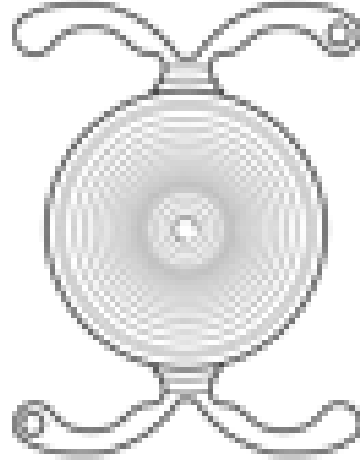
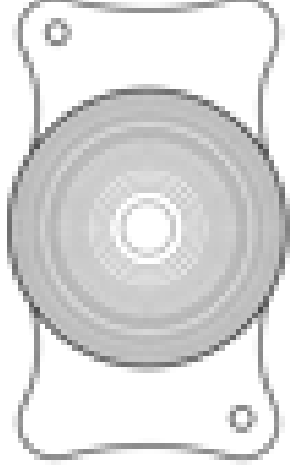
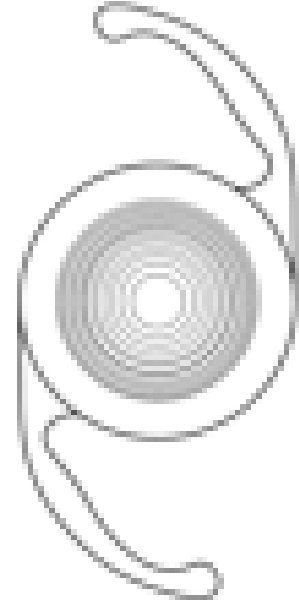
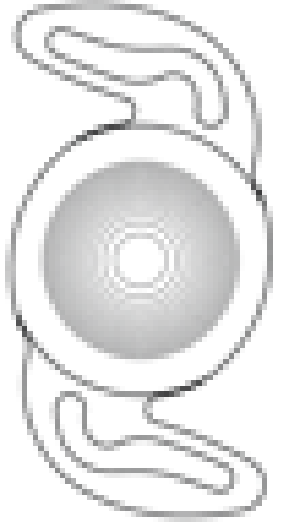
WHY THE DIFFERENCE?

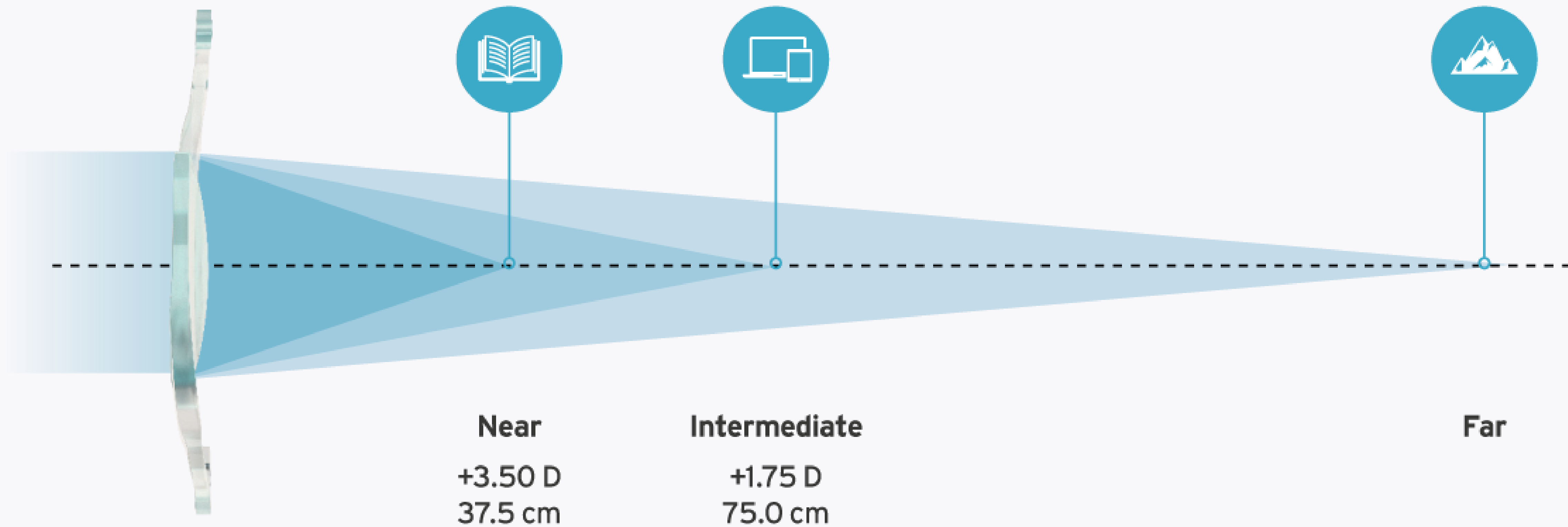


| | PhysIOL FineVision | Zeiss AT LISA Tri | Alcon PanOptix | Rayner Trifocal |
|---|---|---|---|---|
| |  |  |  |  |
| Diffractive Technology | Diffractive Apodized Trifocal across full optic surface | Diffractive Trifocal up to 4.34 mm thereafter bifocal | Diffractive Trifocal up to 4.5 mm thereafter monofocal | Diffractive Trifocal up to 4.5 mm thereafter monofocal |
| Diffractive Steps | 26 diffractive steps | 29 diffractive steps 0.0 D | 15 diffractive steps | 16 diffractive steps |
| Diffractive Orders | 0, 1, 2 | 0, 1, 2 | 0, 2, 3 (non-sequential) | -1, 0, 1 |
| Light Loss 3.0 mm pupil | 14% | 14.3% (Ave.) | 12% | 11% |
| Light Energy Split 3.0 mm pupil | 42% D / 15% I / 29% N | 50% D / 20% I / 30% N | 42% D / 24% I / 22% N (includes 12% light loss) | 52% D / 22% I / 26% N |
| Optic Add Powers | +3.50 D Near add +1.75 D Intermediate add | +3.33 D Near add +1.66 D Intermediate add | +3.25 D Near add +2.17 D Intermediate add | +3.50 D Near add +1.75 D Intermediate add |
| Reading Distance | 37.5 cm 75.0 cm | 40.0 cm 80.0 cm | 42.0 cm 60.0 cm | 37.5 cm 75.0 cm |
| Aberration correcting | Biconvex aspheric (-0.11 SA) | Aberration correcting (-0.20 SA) | Aberration correcting (-0.20 SA) | Aberration Neutral |
| Lens Material | Hydrophilic | Hydrophilic | Hydrophobic | Hydrophilic |
| Dioptr range | +6.0 D to +35.0 D | +0.0 D to +32.0 D | +13.0 D to +34.0 D | +0.0 D to +30.0 D |
| Optic / Haptic Diameter | 6.00 mm / 11.45 mm | 6.00 mm / 11.00 mm | 6.00 mm / 13.00 mm | 6.00 mm / 12.50 mm |
| Haptic design | Double C loop | Plate | C loop | Closed C loop |
| PCO rate (estimated by review on studies stating YAG: caps rates on monofocal lenses) | Medium (24 months) | High (24 months) | Low (24 months) | Low (1.7% @ 24 months) |
| Filtration | UV and blue light | UV | UV and blue light | UV |
| Angulation | 5° | 0° | 0° | 0° |
| Injection System | Loadable | Semi preloaded | Loadable | Preloaded |
| Nozzle Tip Size | 1.74 mm | 1.65 mm | 2.0 mm x 1.5 mm | 1.65 mm |
| Incision Size (wound in) | 2.4 mm | 2.2 mm | 2.4 mm | 2.2 mm |

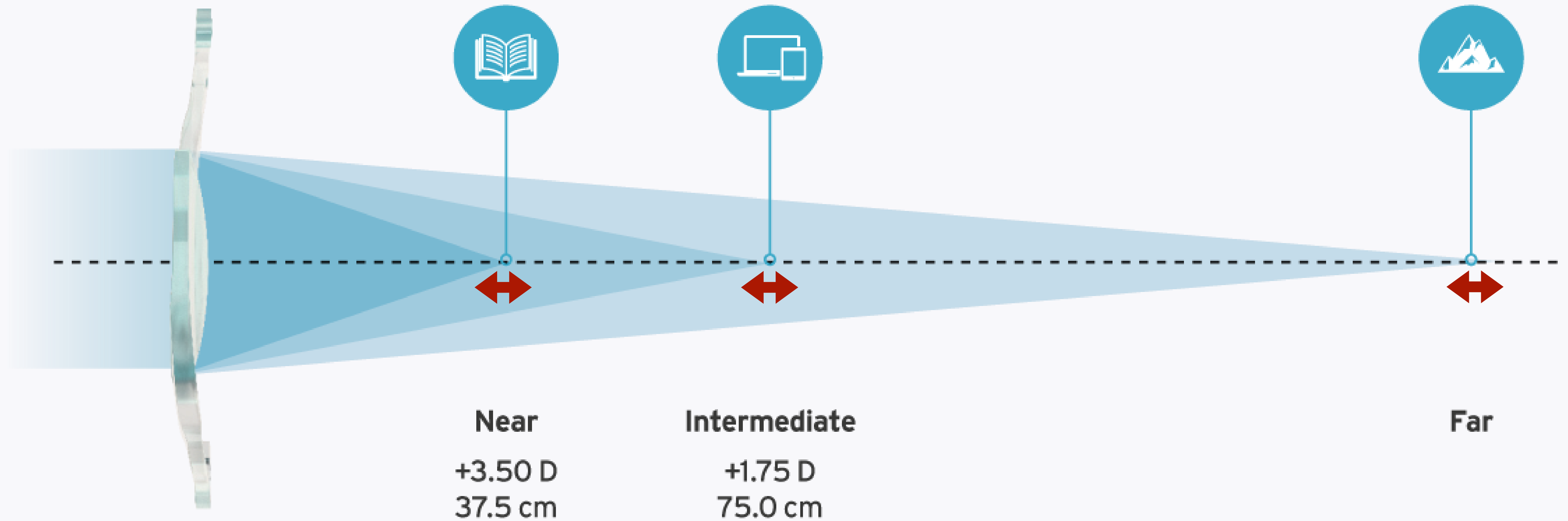
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| Reading Distance | 37.5 cm 75.0 cm | 40.0 cm 80.0 cm | 42.0 cm 60.0 cm | 37.5 cm 75.0 cm |
| Aberration correcting | Biconvex aspheric (-0.11 SA) | Aberration correcting (-0.20 SA) | Aberration correcting (-0.20 SA) | Aberration Neutral |
| Lens Material | Hydrophilic | Hydrophilic | Hydrophobic | Hydrophilic |
| Dioptre range | +6.0 D to +35.0 D | +0.0 D to +32.0 D | +13.0 D to +34.0 D | +0.0 D to +30.0 D |
| Optic / Haptic Diameter | 6.00 mm / 11.45 mm | 6.00 mm / 11.00 mm | 6.00 mm / 13.00 mm | 6.00 mm / 12.50 mm |
| Haptic design | Double C loop | Plate | C loop | Closed C loop |
| PCO rate (estimated by review on studies stating YAG: caps rates on monofocal lenses) | Medium (24 months) | High (24 months) | Low (24 months) | Low (1.7% @ 24 months) |

| | PhysIOL FineVision | Zeiss AT LISA Tri | Alcon PanOptix | Rayner Trifocal |
|---|--|---|---|---|
| |  |  |  |  |
| Diffractive Technology | Diffractive Apodized Trifocal across full optic surface | Diffractive Trifocal up to 4.34 mm thereafter bifocal | Diffractive Trifocal up to 4.5 mm thereafter monofocal | Diffractive Trifocal up to 4.5 mm thereafter monofocal |
| Diffractive Steps | 26 diffractive steps | 29 diffractive steps 0.0 D | 15 diffractive steps | 16 diffractive steps |
| Diffractive Orders | 0, 1, 2 | 0, 1, 2 | 0, 2, 3 (non-sequential) | -1, 0, 1 |
| Light Loss 3.0 mm pupil | 14% | 14.3% (Ave.) | 12% | 11% |
| Light Energy Split 3.0 mm pupil | 42% D / 15% I / 29% N | 50% D / 20% I / 30% N | 42% D / 24% I / 22% N (includes 12% light loss) | 52% D / 22% I / 26% N |
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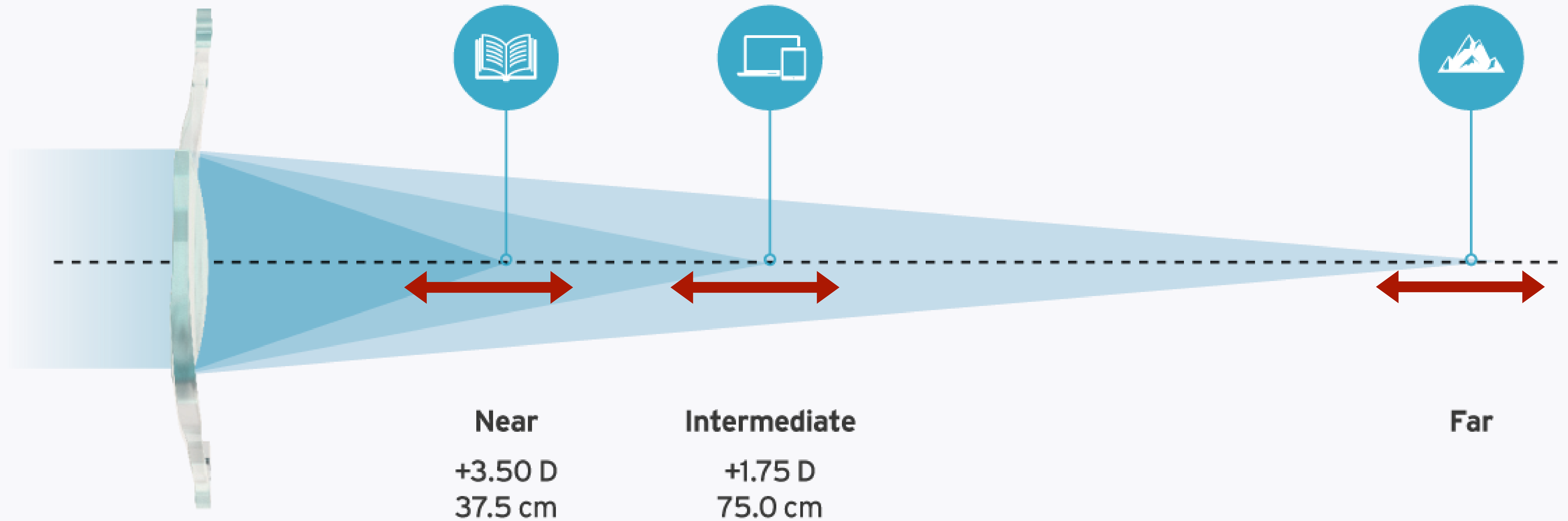


Aberration Correcting Trifocal



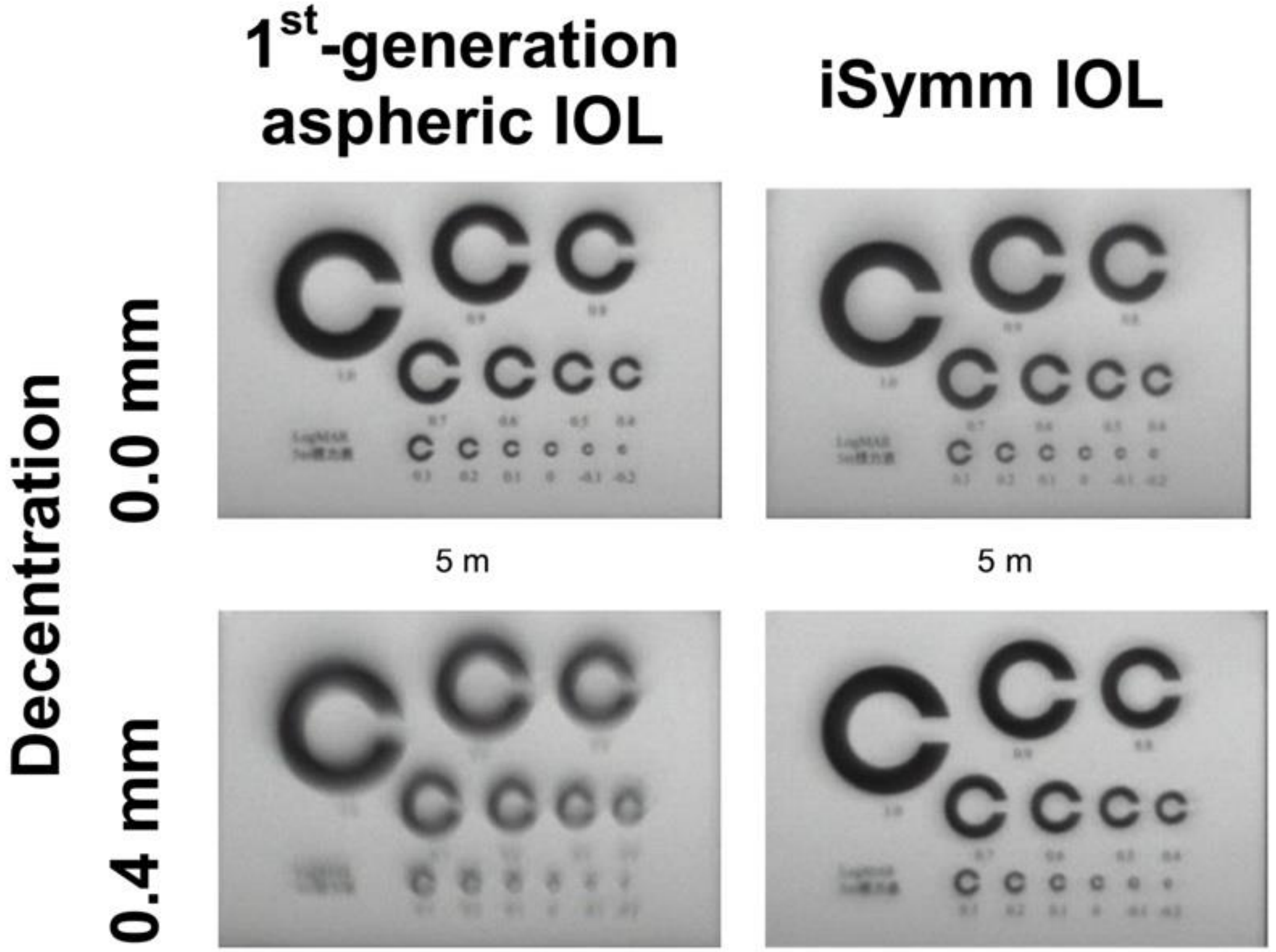
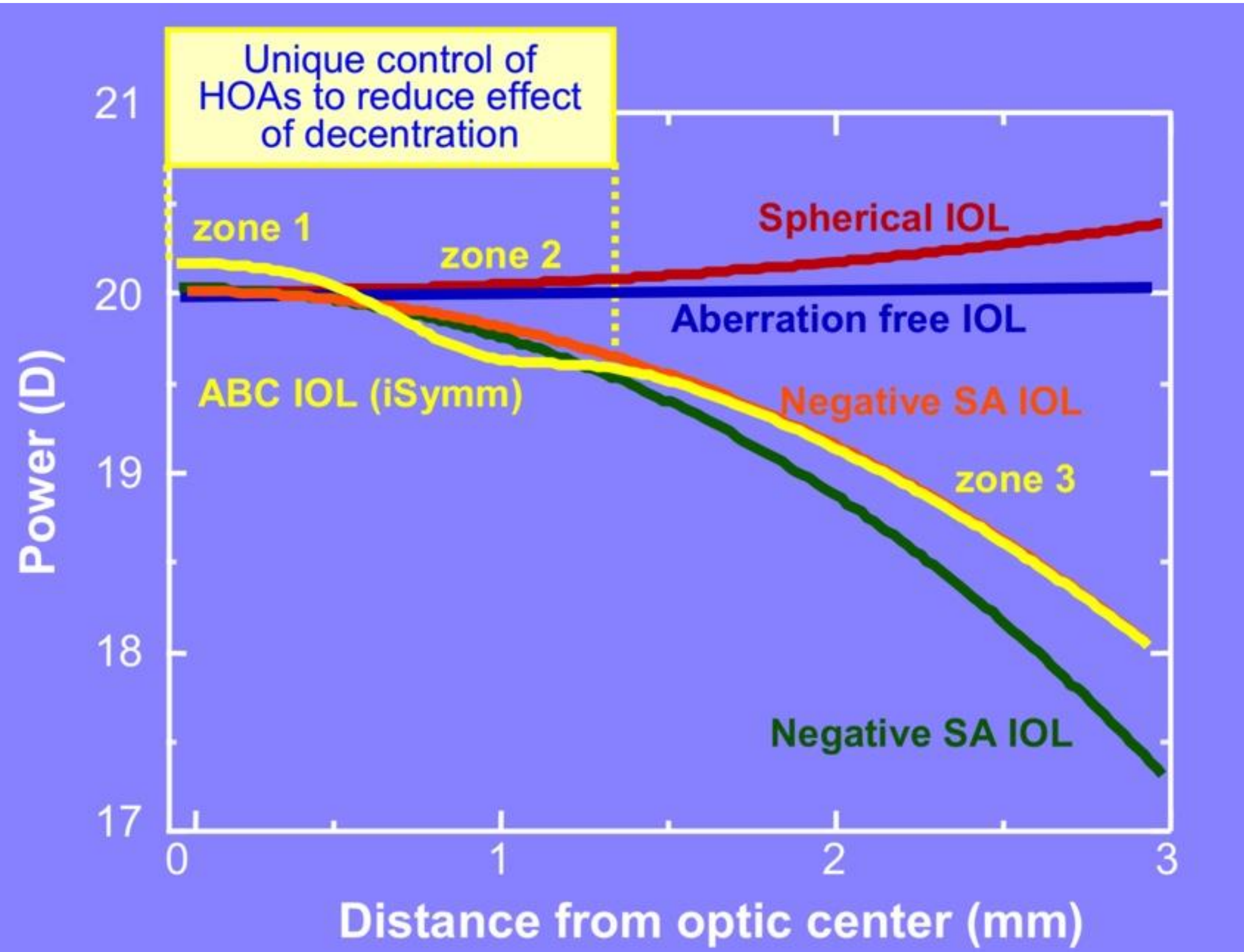
Less forgiving

Aberration Neutral Trifocal

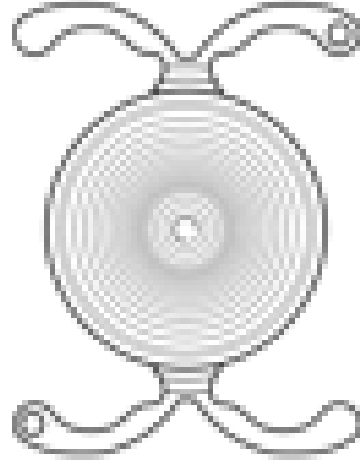
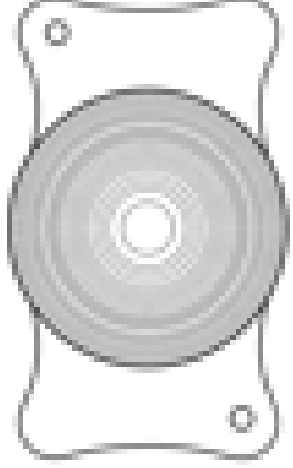
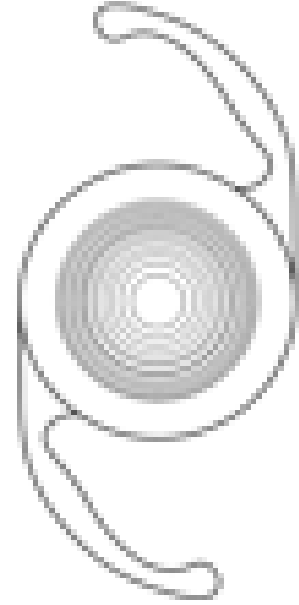
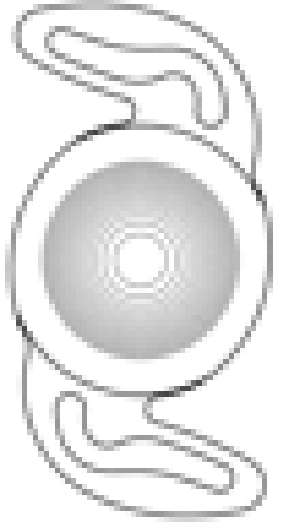


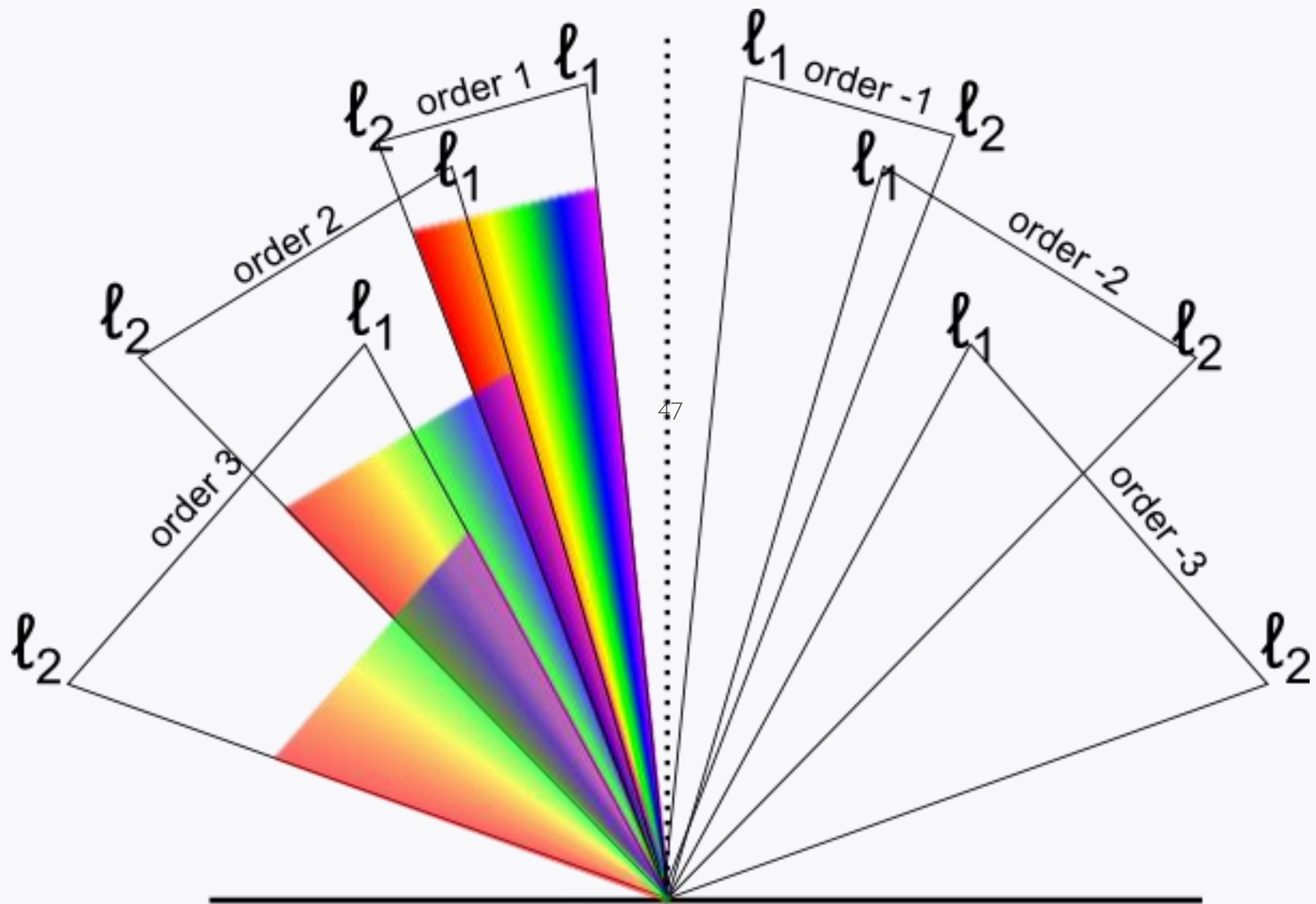
More forgiving

Aberration Neutral Trifocal

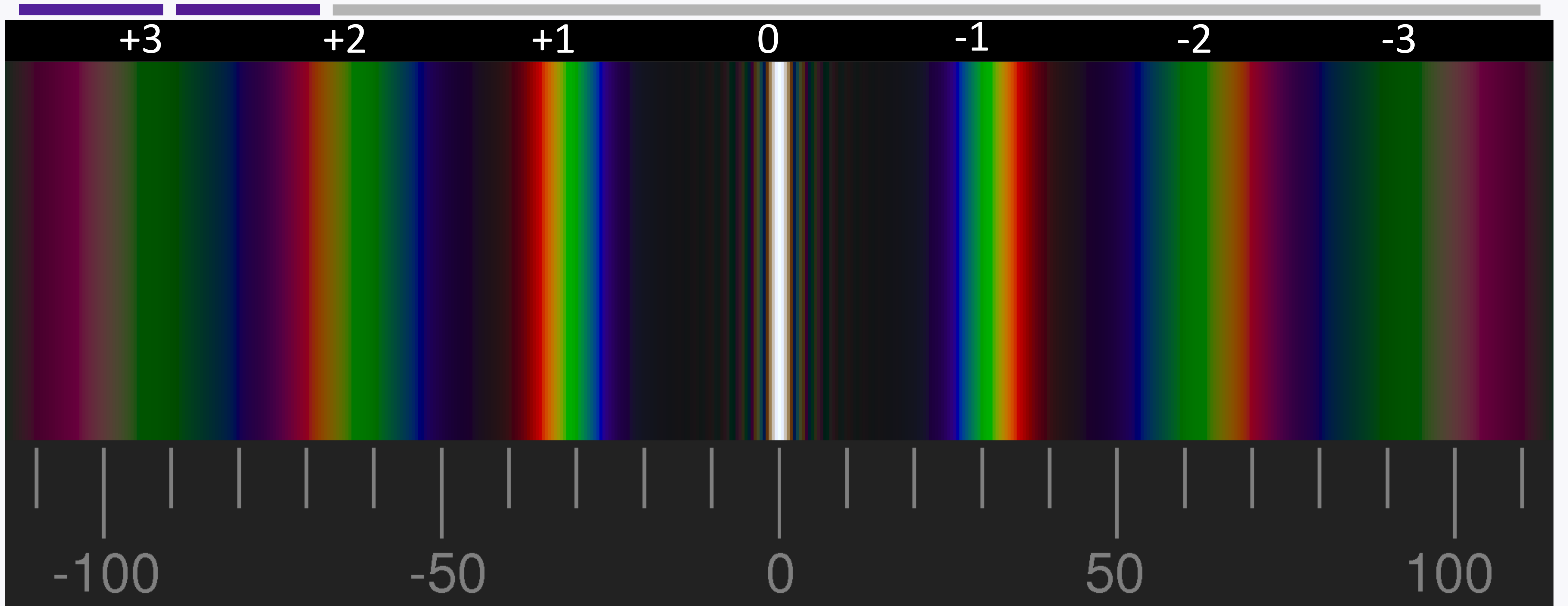


More forgiving for decentration

| | PhysIOL FineVision | Zeiss AT LISA Tri | Alcon PanOptix | Rayner Trifocal |
|---|--|---|---|---|
| |  |  |  |  |
| Diffractive Technology | Diffractive Apodized Trifocal across full optic surface | Diffractive Trifocal up to 4.34 mm thereafter bifocal | Diffractive Trifocal up to 4.5 mm thereafter monofocal | Diffractive Trifocal up to 4.5 mm thereafter monofocal |
| Diffractive Steps | 26 diffractive steps | 29 diffractive steps 0.0 D | 15 diffractive steps | 16 diffractive steps |
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| Light Loss 3.0 mm pupil | 14% | 14.3% (Ave.) | 12% | 11% |
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| Aberration correcting | Biconvex aspheric (-0.11 SA) | Aberration correcting (-0.20 SA) | Aberration correcting (-0.20 SA) | Aberration Neutral |
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| Optic / Haptic Diameter | 6.00 mm / 11.45 mm | 6.00 mm / 11.00 mm | 6.00 mm / 13.00 mm | 6.00 mm / 12.50 mm |
| Haptic design | Double C loop | Plate | C loop | Closed C loop |
| PCO rate (estimated by review on studies stating YAG: caps rates on monofocal lenses) | Medium (24 months) | High (24 months) | Low (24 months) | Low (1.7% @ 24 months) |



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Near

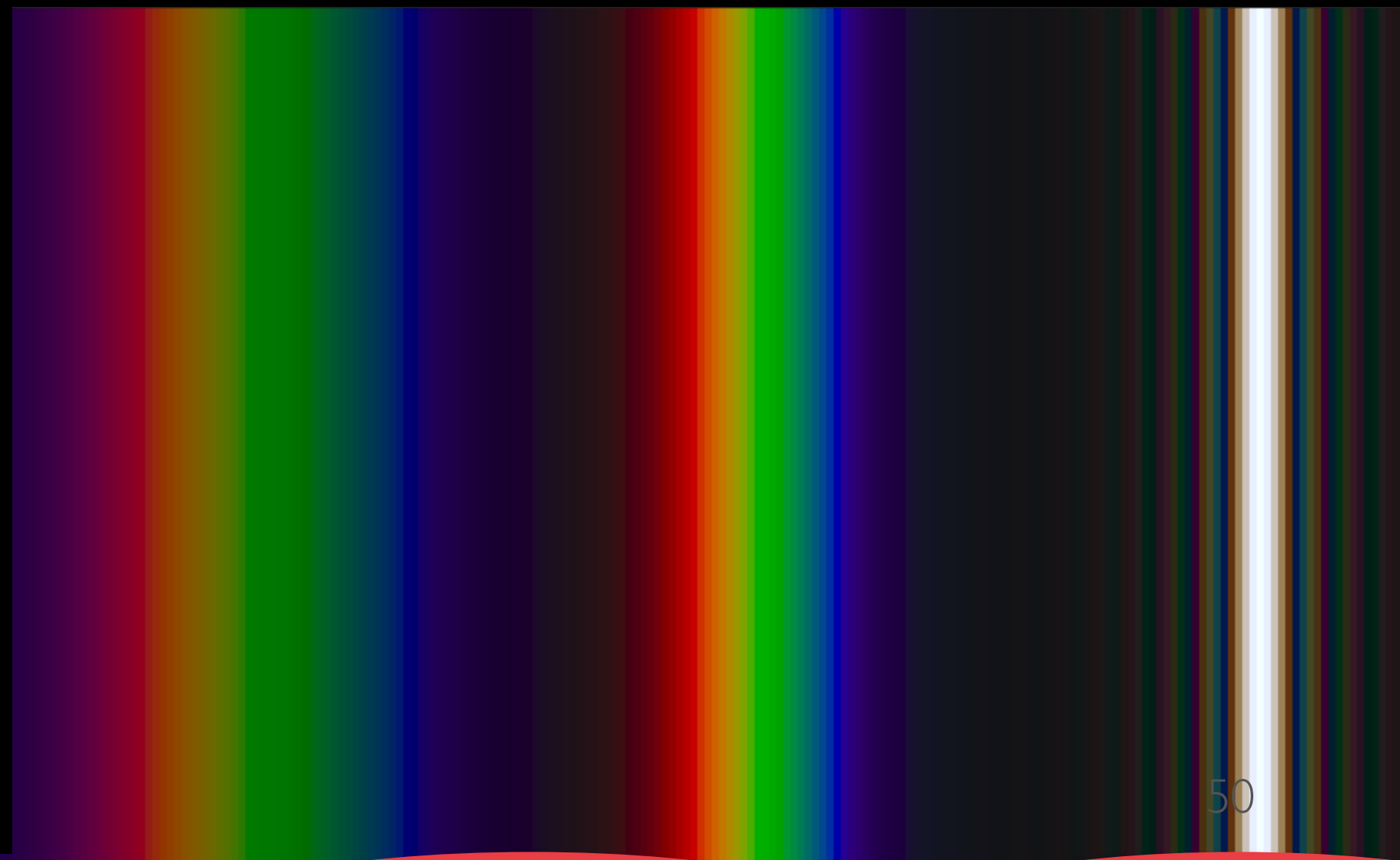
Intermediate

Distance

+2

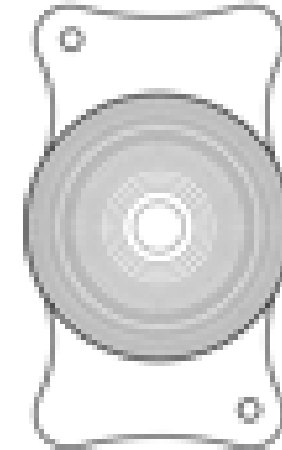
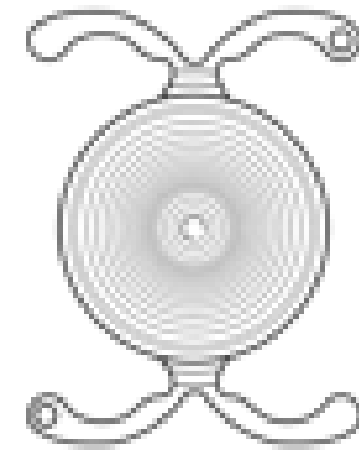
+1

0

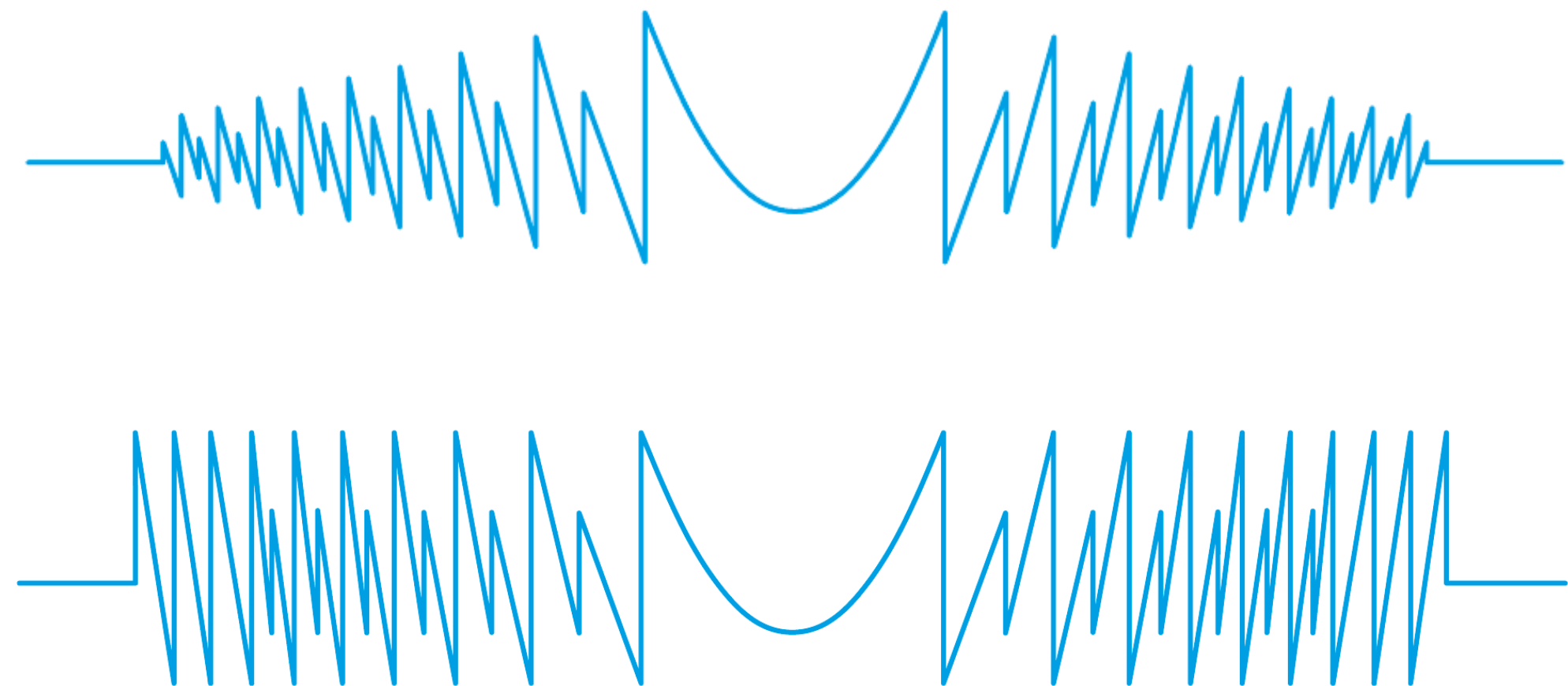


PhysIOL FineVision

Zeiss AT LISA Tri



Combination of 2 Asymmetric Patterns



Diffractive Technology

Diffractive Apodized Trifocal across full optic surface

Diffractive Trifocal up to 4.34 mm thereafter bifocal

Diffractive Steps

26 diffractive steps

29 diffractive steps 0.0 D

Diffractive Orders

0, 1, 2

0, 1, 2

Near

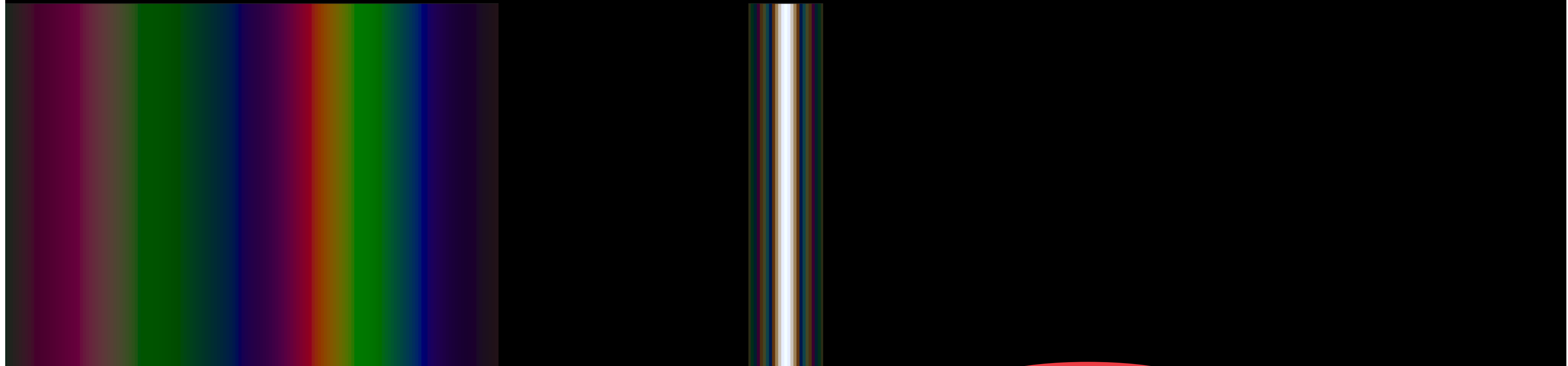
Intermediate

Distance

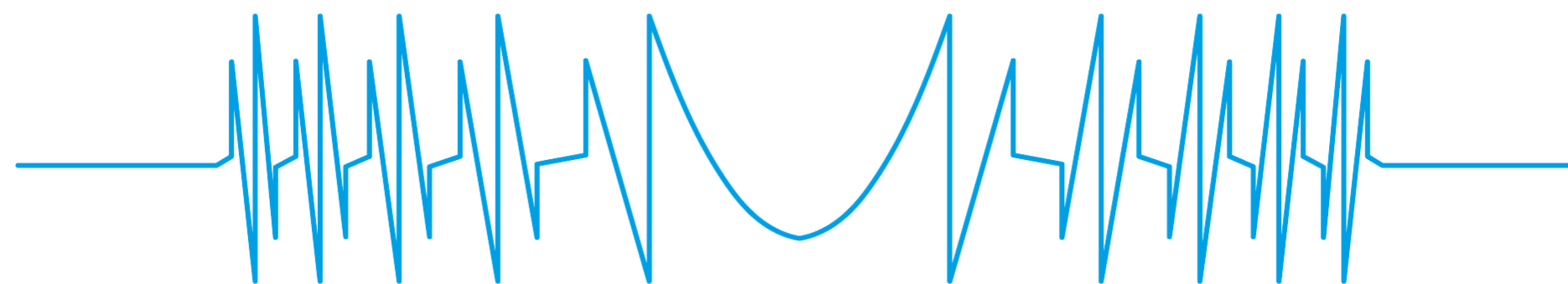
+3

+2

0



2 Asymmetric Patterns /
Non-Sequential Orders



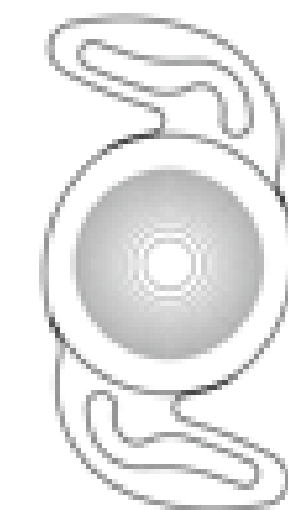
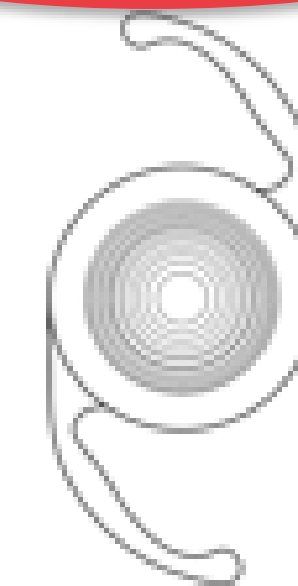
Diffractive Technology

Diffractive Steps

Diffractive Orders

Alcon PanOptix

Rayner Trifocal



Diffractive Trifocal up to 4.5 mm thereafter monofocal

Diffractive Trifocal up to 4.5 mm thereafter monofocal

15 diffractive steps

16 diffractive steps

0, 2, 3 (non-sequential)

-1, 0, 1

Near

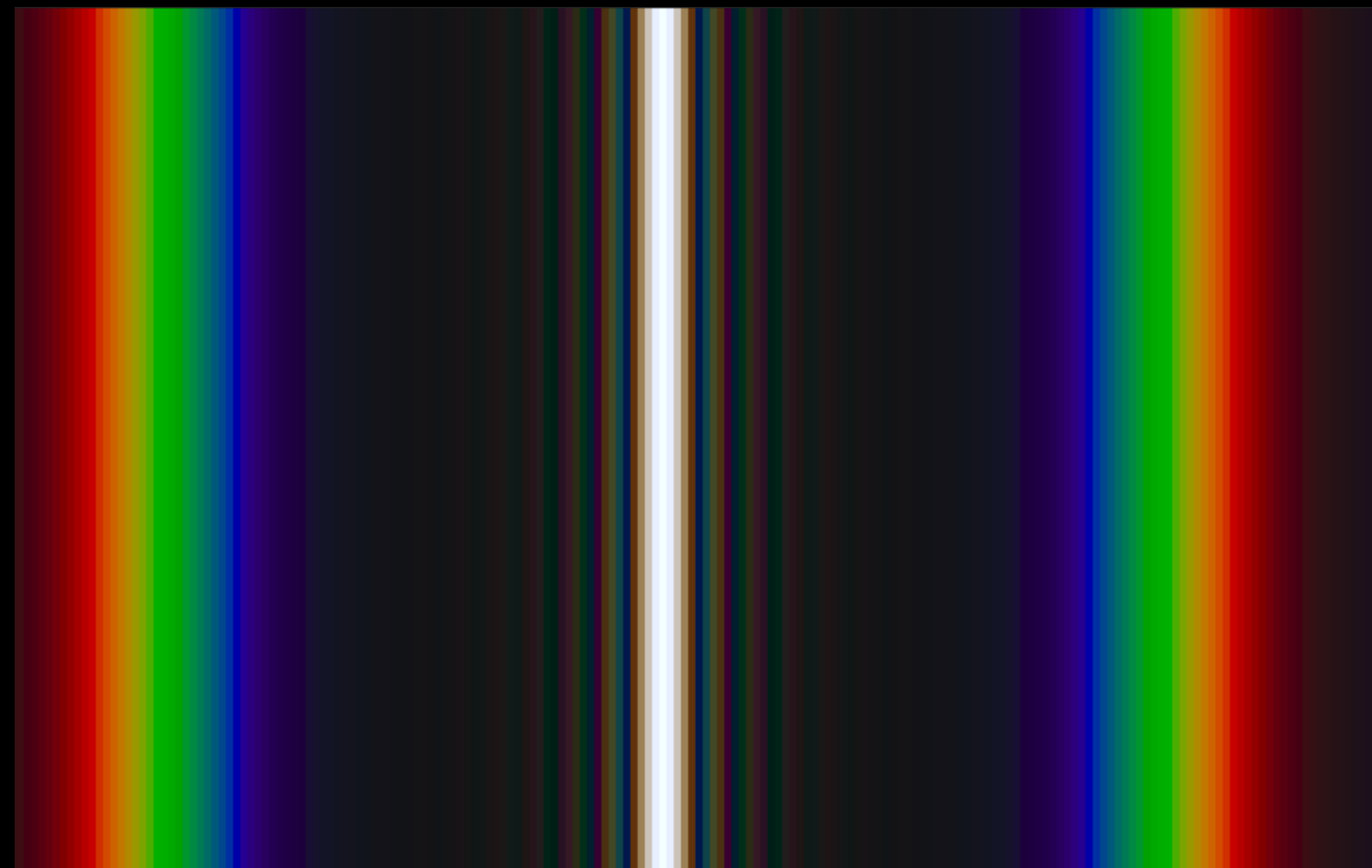
Intermediate

Distance

+1

0

-1

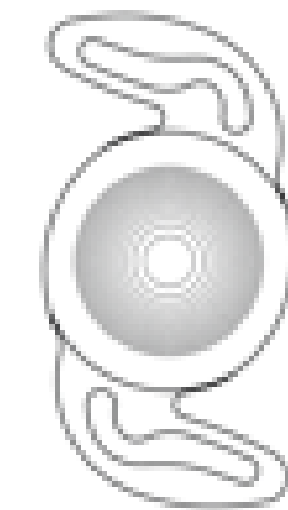
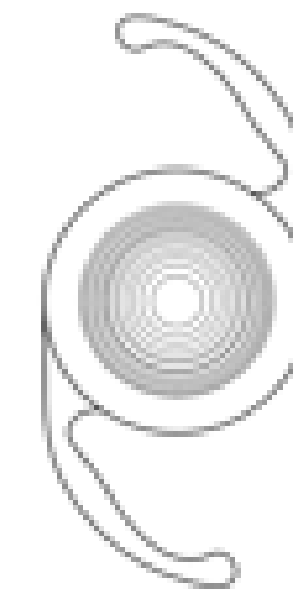
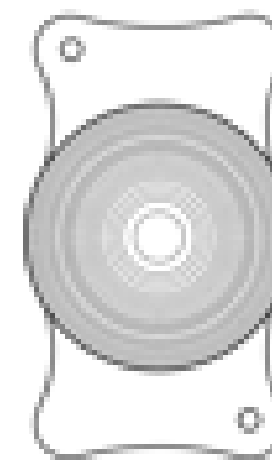
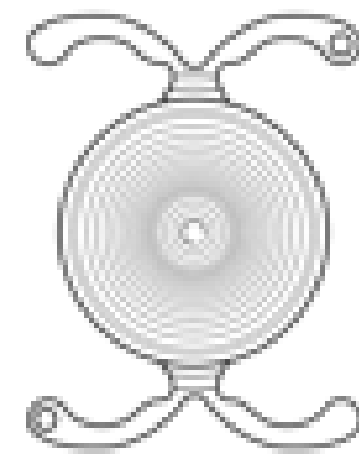


PhysIOL FineVision

Zeiss AT LISA Tri

Alcon PanOptix

Rayner Trifocal



Diffractive Technology

Diffractive Apodized Trifocal across full optic surface

Diffractive Trifocal up to 4.34 mm thereafter bifocal

Diffractive Trifocal up to 4.5 mm thereafter monofocal

Diffractive Trifocal up to 4.5 mm thereafter monofocal

Diffractive Steps

26 diffractive steps

29 diffractive steps 0.0 D

15 diffractive steps

16 diffractive steps

Diffractive Orders

0, 1, 2

0, 1, 2

0, 2, 3 (non-sequential)

-1, 0, 1

Near

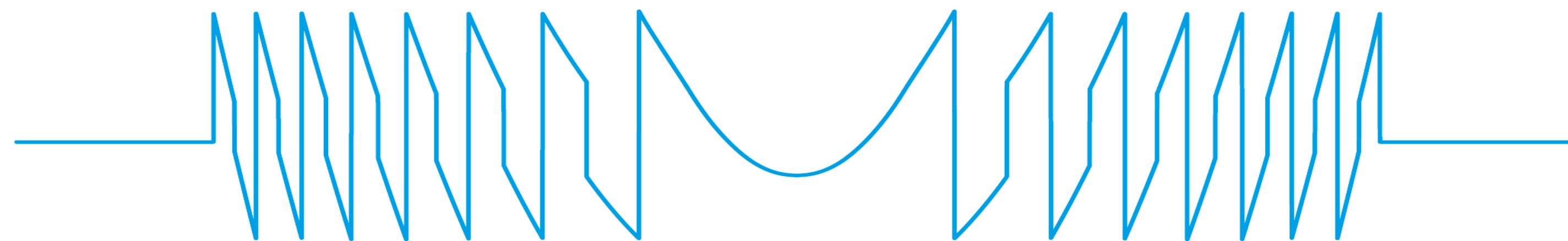
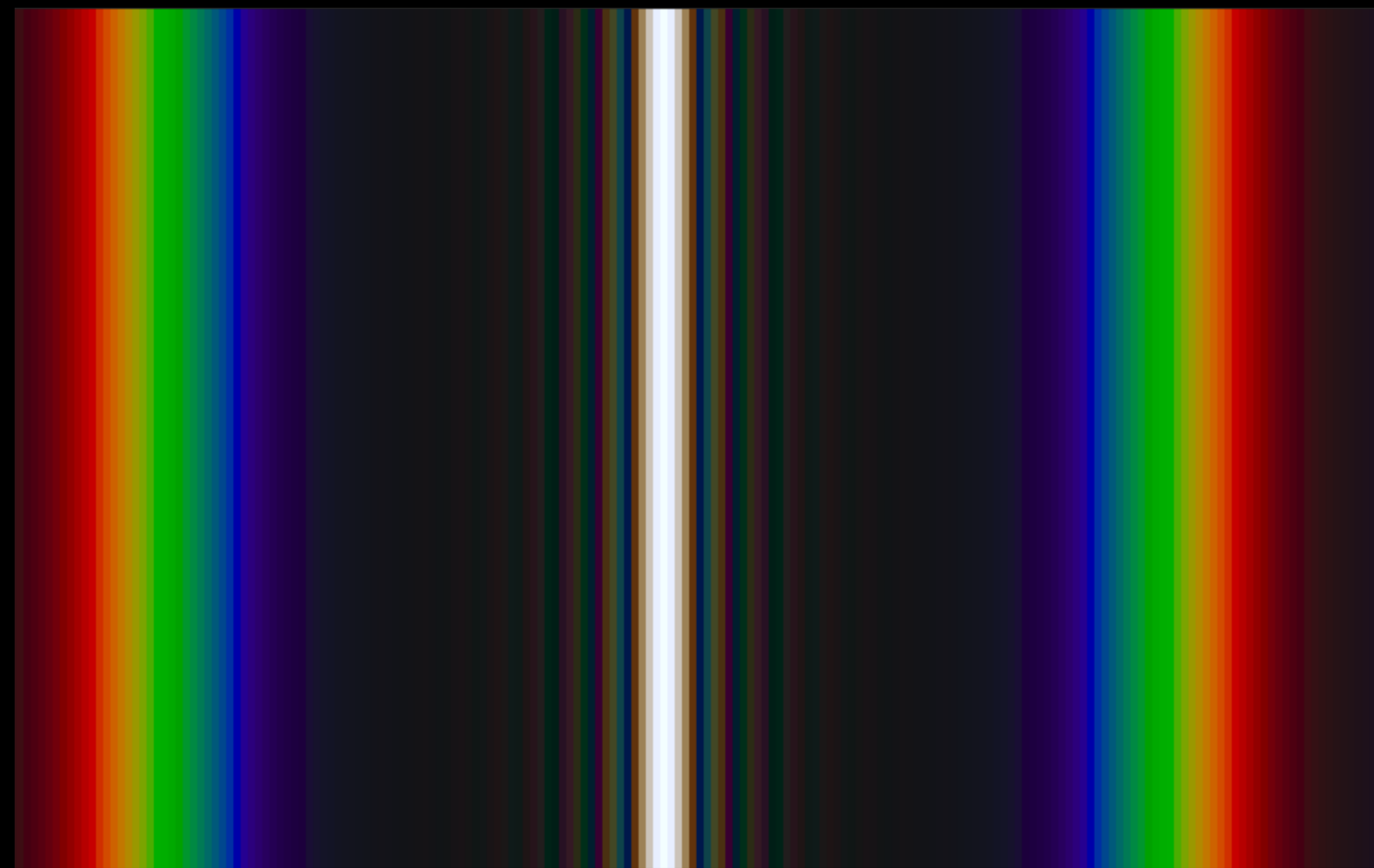
Intermediate

Distance

+1

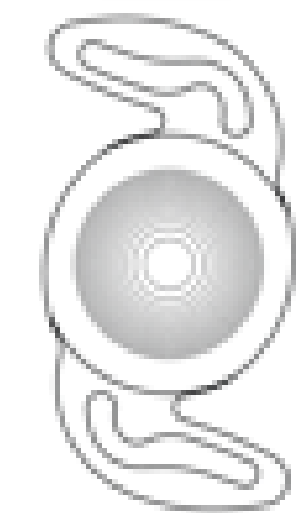
0

-1



RayOne® Trifocal

Rayner Trifocal

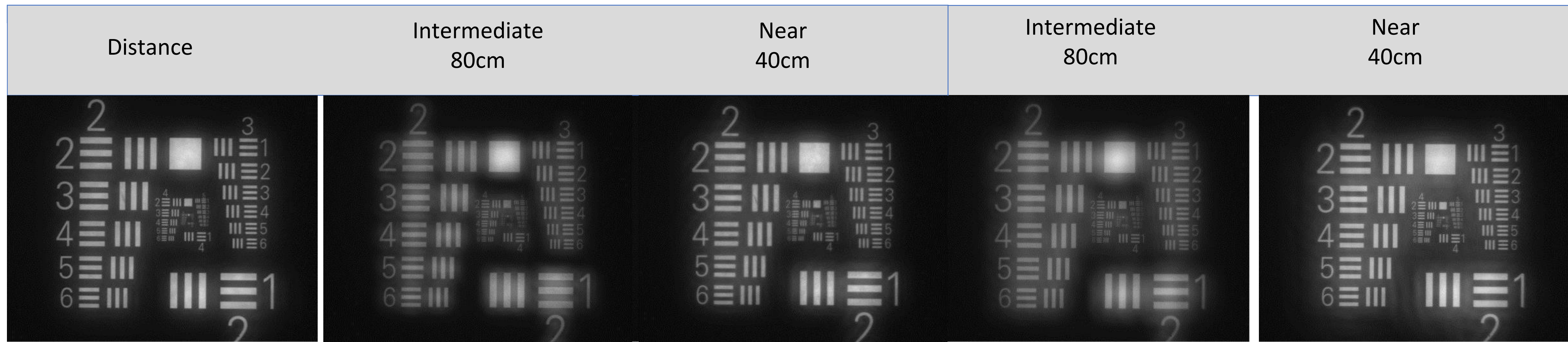


Diffractive Trifocal up to 4.5 mm thereafter monofocal

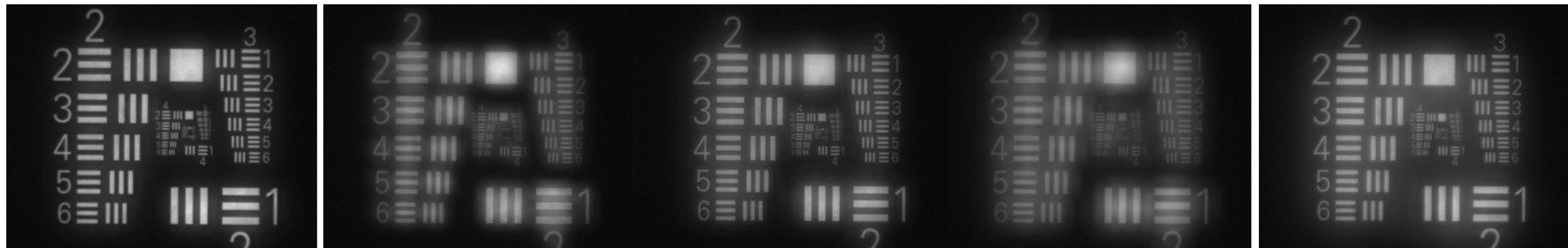
16 diffractive steps

-1, 0, 1

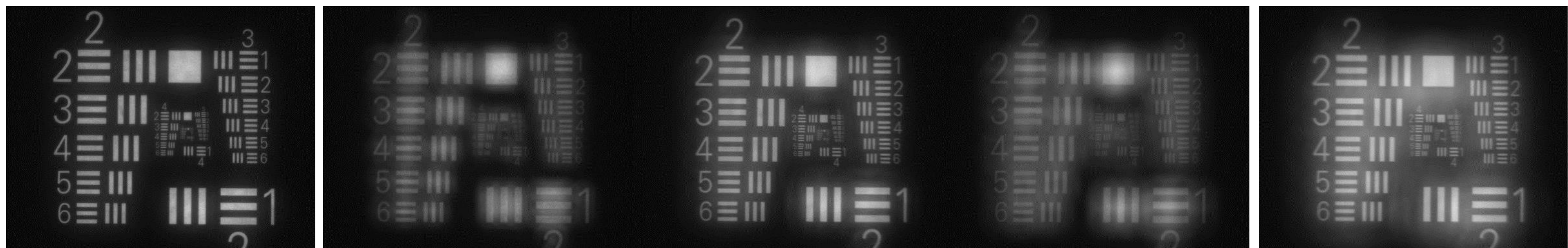
Rayner
RayOne Trifocal



Zeiss
AT LISA Tri



PhysIOL
FineVision



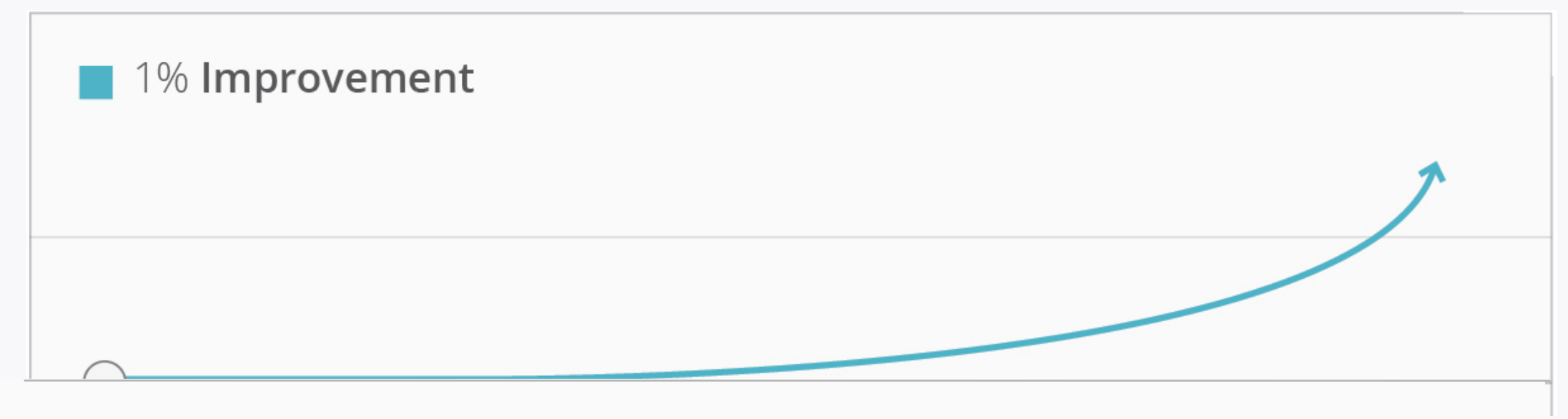
3.0 mm pupil size

4.5 mm pupil size

CONCLUSION

- IOL differences - fine margins of benefits in multiple areas have cumulative benefit
 - Aberration Neutral \longrightarrow More forgiving lens
 - Better Depth of focus around each trifocal point - Better Distance and better near
 - A Constant 118.8 - Results in +0.2D to -0.2D range for distance
 - Better light transmission for Distance (4-11% better) (brightest / most focused diffractive orders -1, 0, +1)
 - 16 Diffractive Rings over 4.5mm
- Cumulative effect for better outcomes of DVA, and NVA

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CONCLUSION

- Hydrophilic Trifocal Sulcoflex in the Sulcus

- Versatile and Reversible

Zero Power



- Preferred Monofocal lens in the bag

- Safe and Reliable

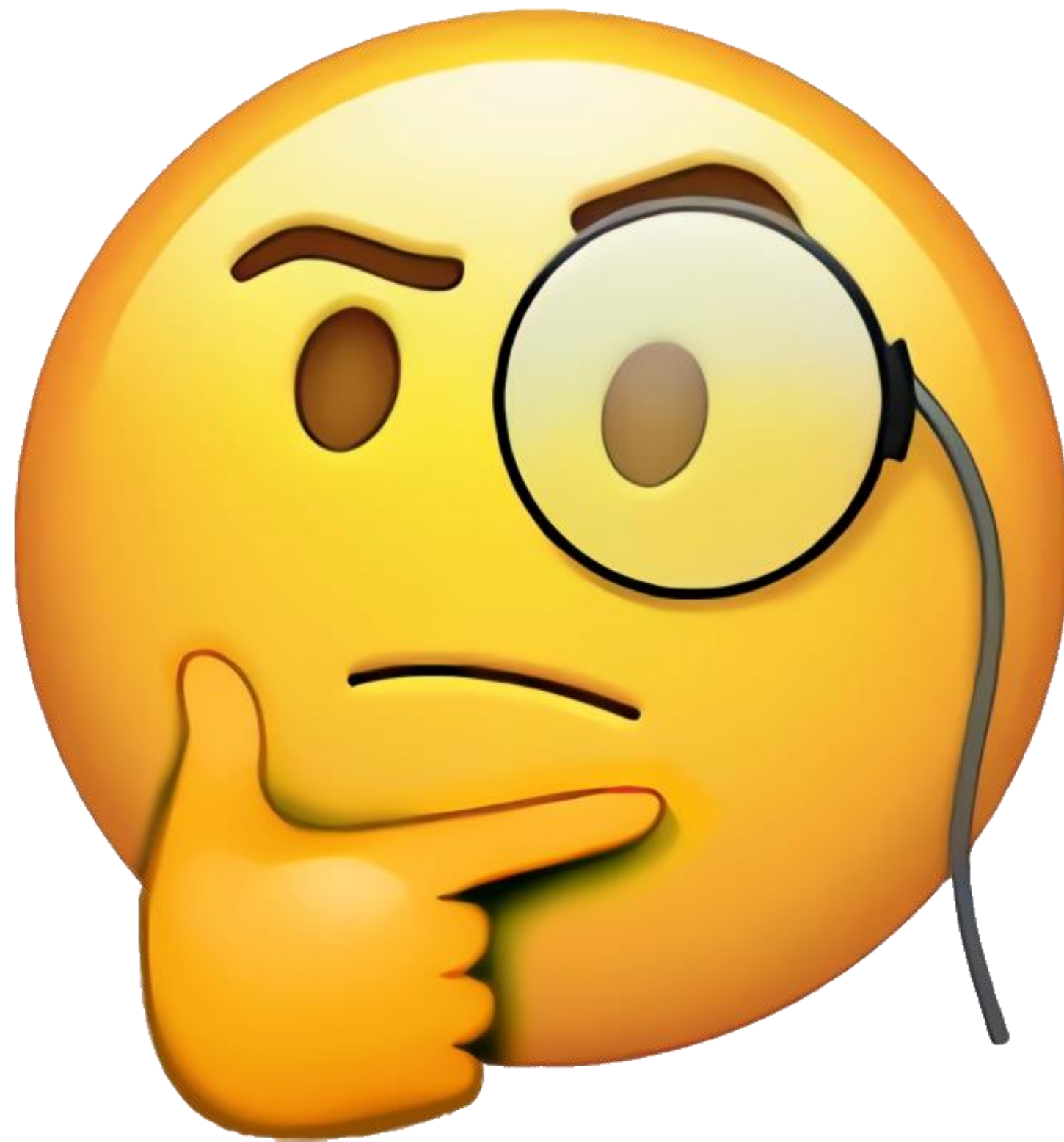
Customisable for

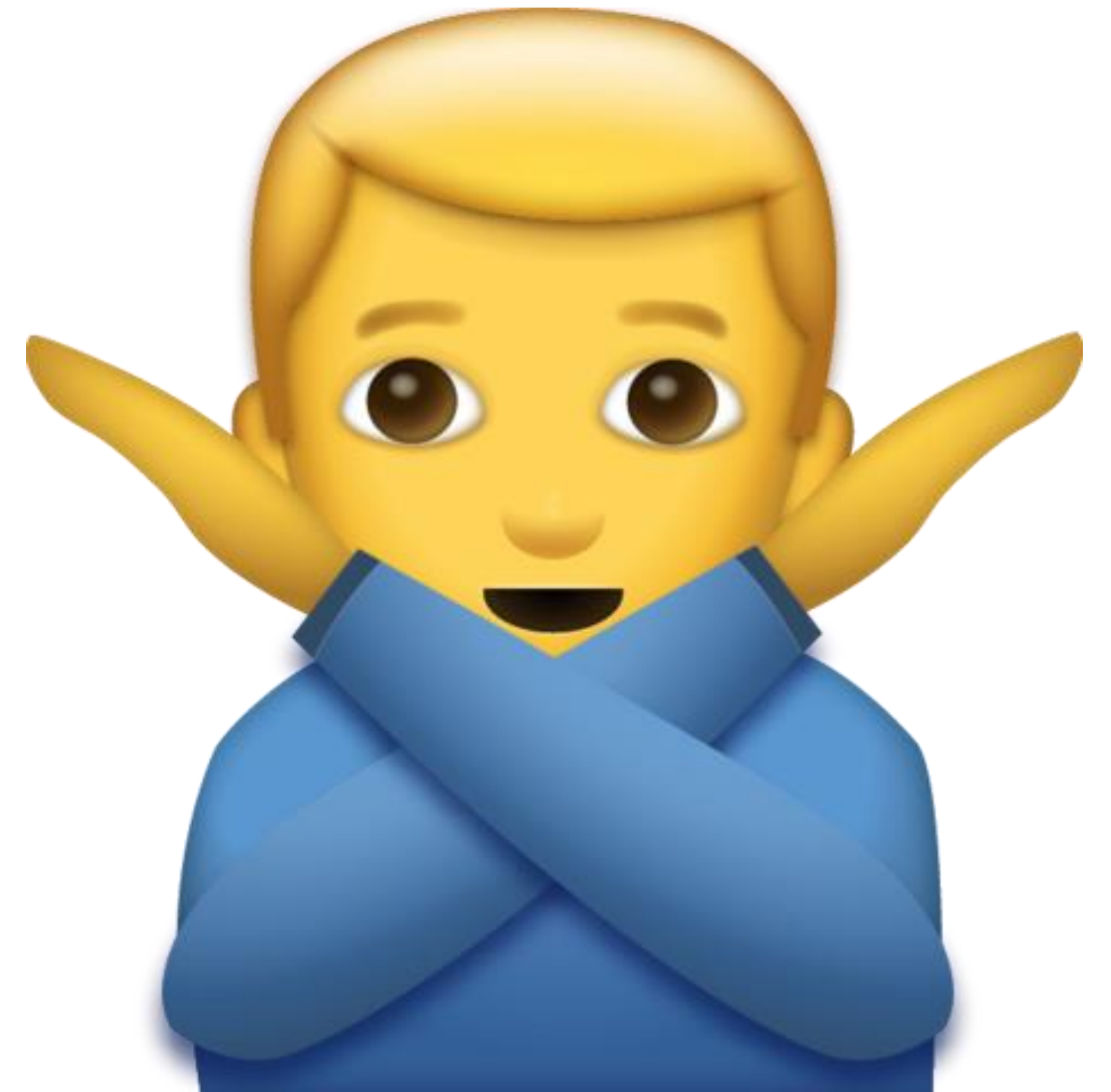
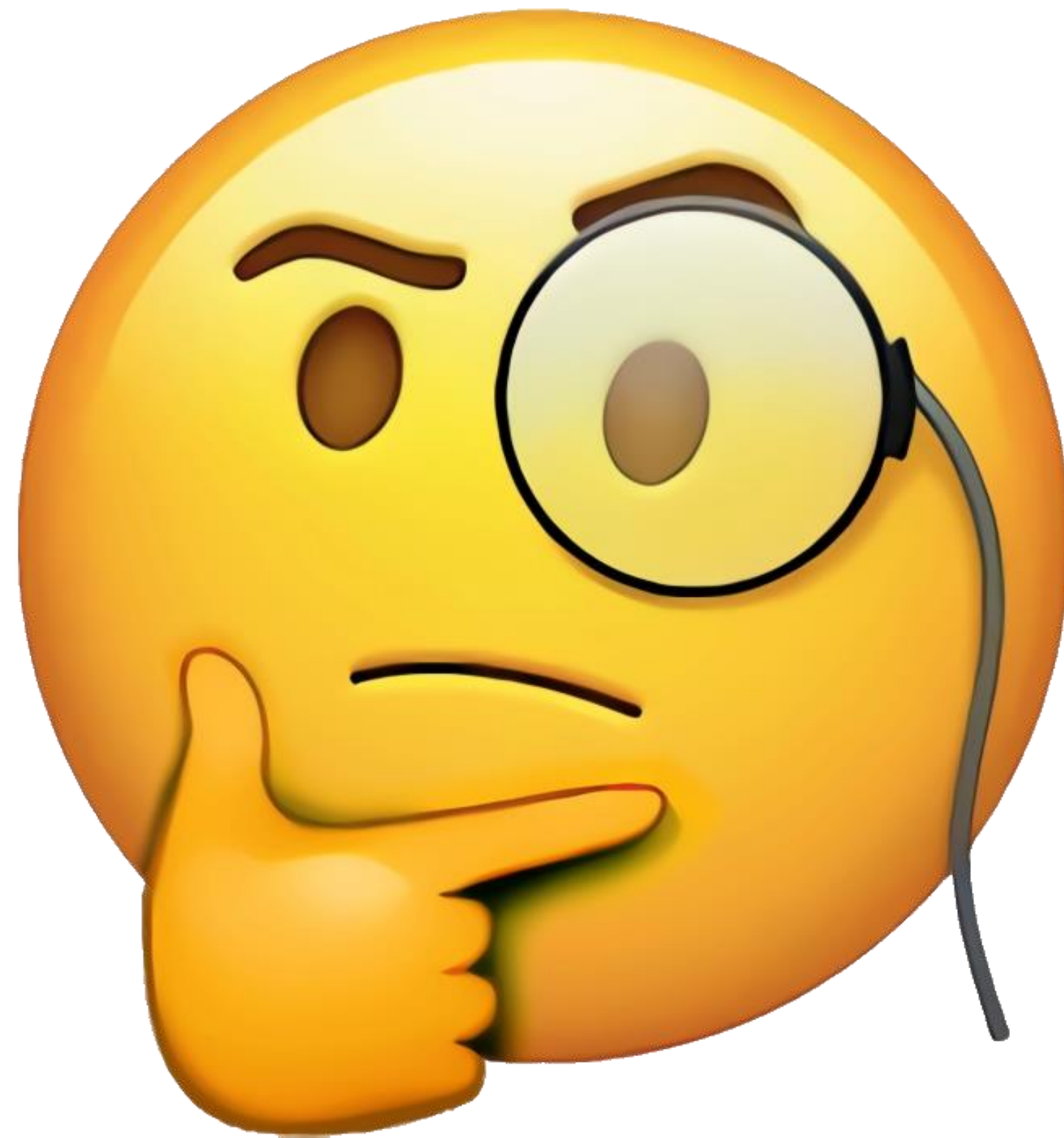
- Spheric Aberration
- Blue Filter
- Toricity

DUET Procedure

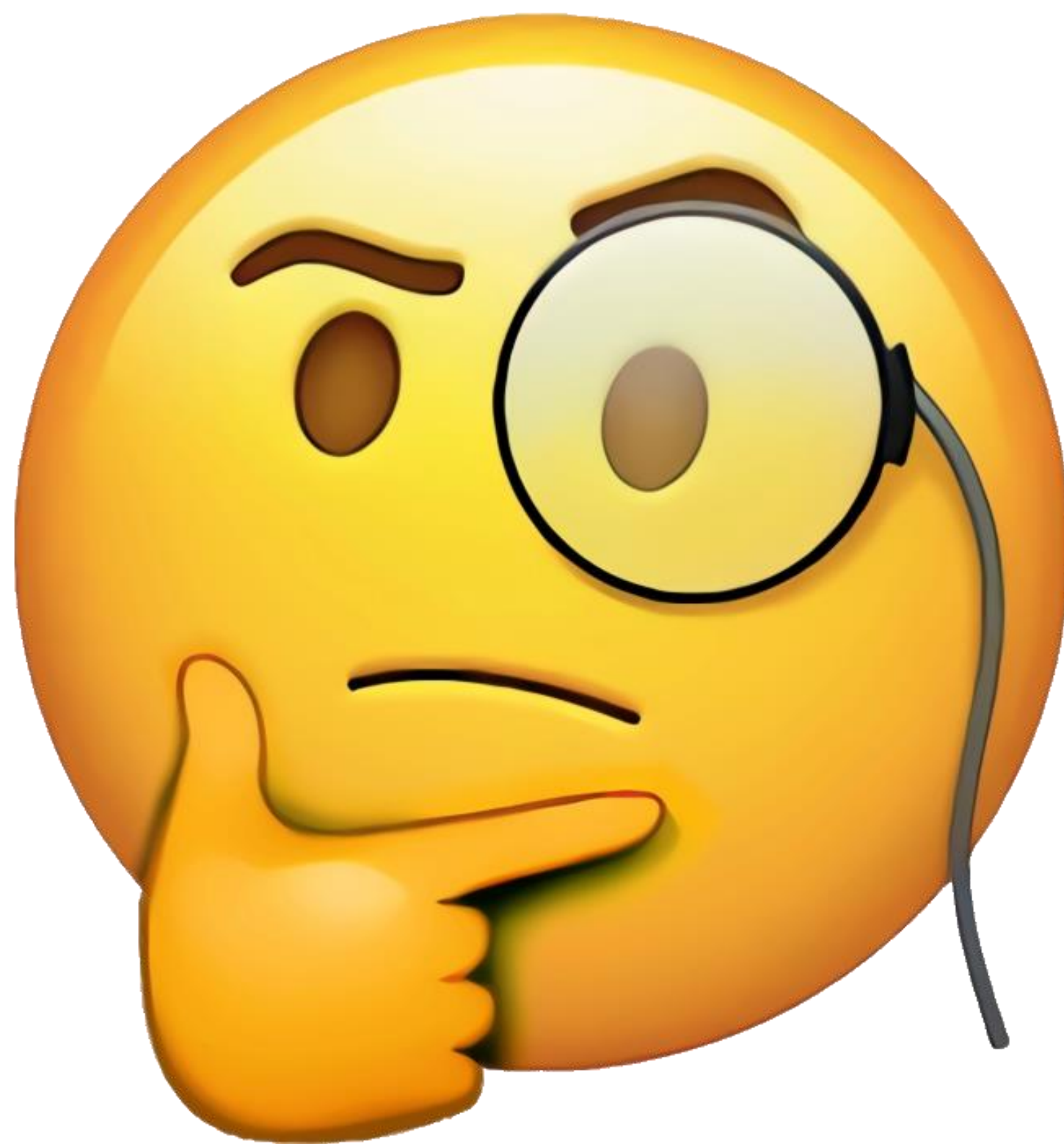
- Patients understand and appreciate the safety aspect
- Simple surgical step
- Indefinite period of neuro-adaption₅₇
- YAG not an issue
- Borderline cases become viable
- Customise 'In the Bag' IOL Selection
- Future options available







New Gold Standard?



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