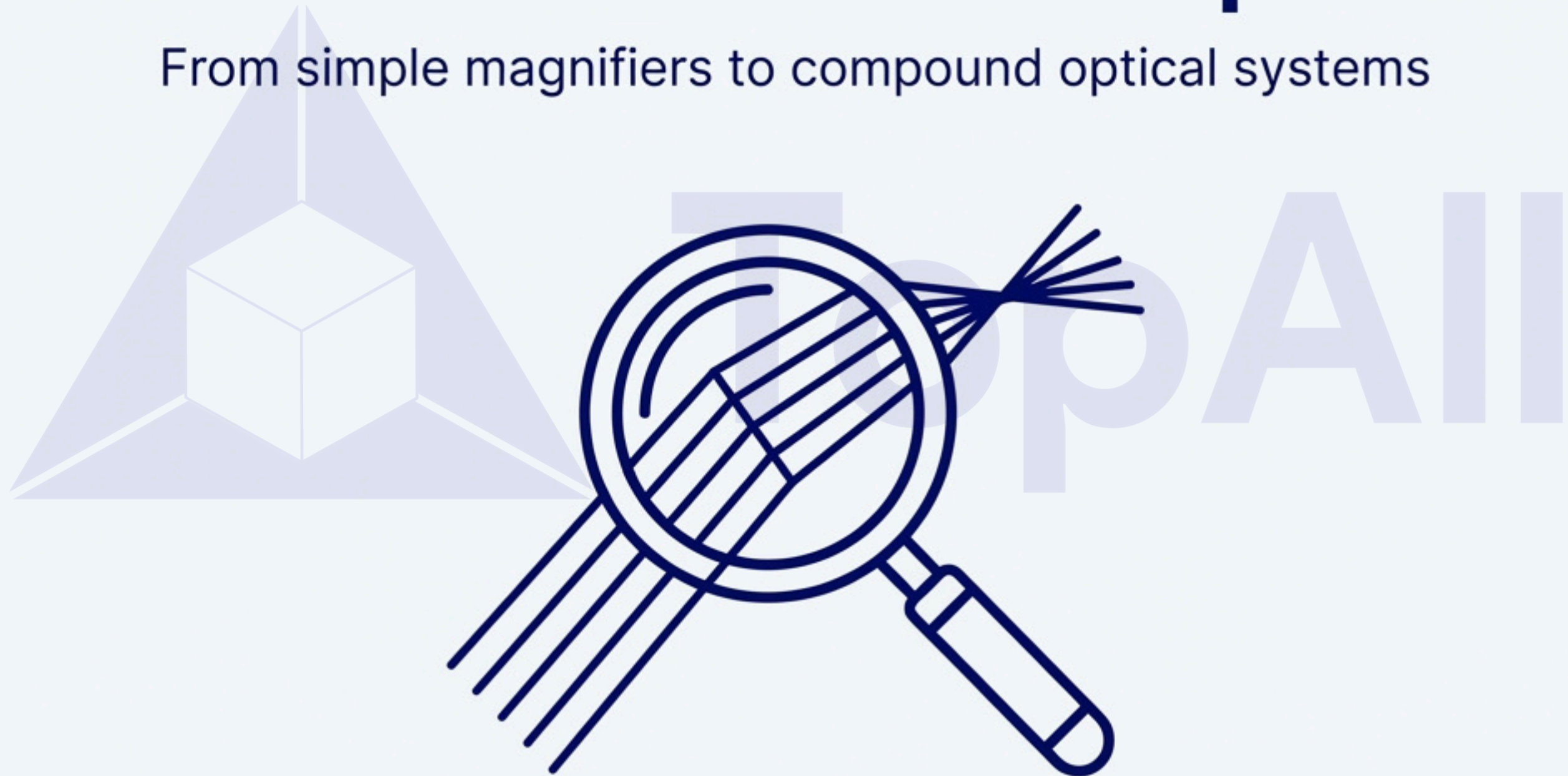


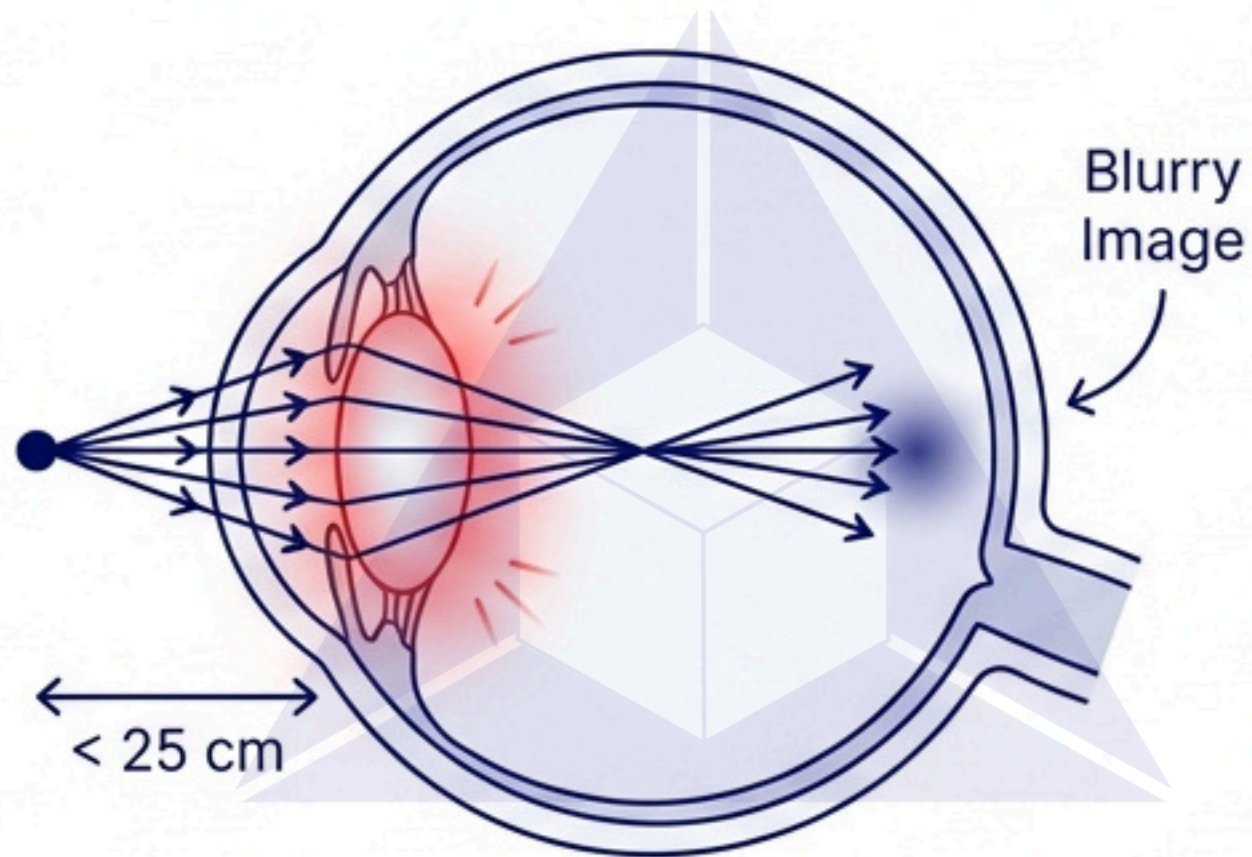
9.7.1 The Microscope

From simple magnifiers to compound optical systems



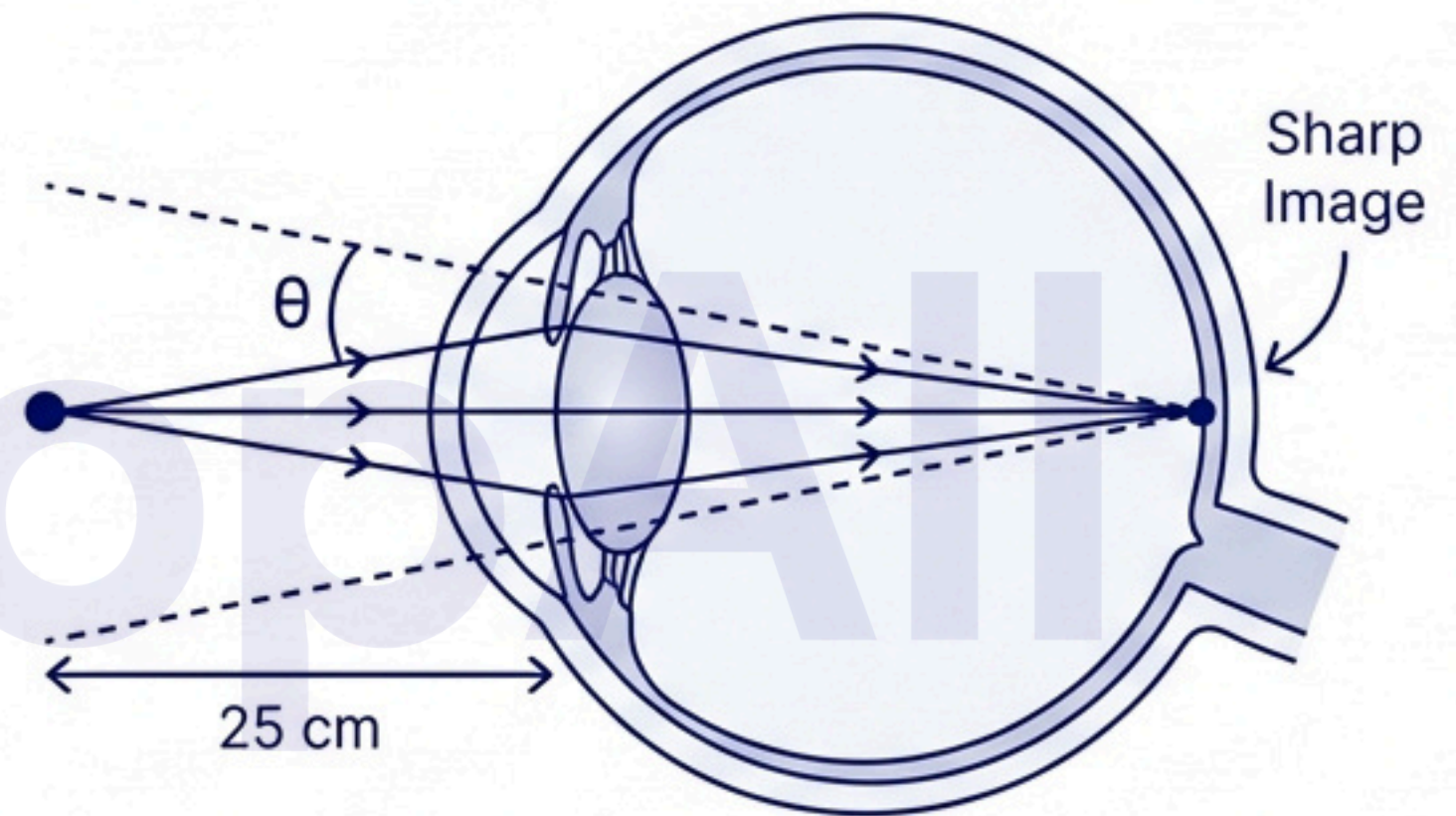
The Biological Limit of Vision

Object Closer Than 25 cm



The Near Point ($D \approx 25 \text{ cm}$)

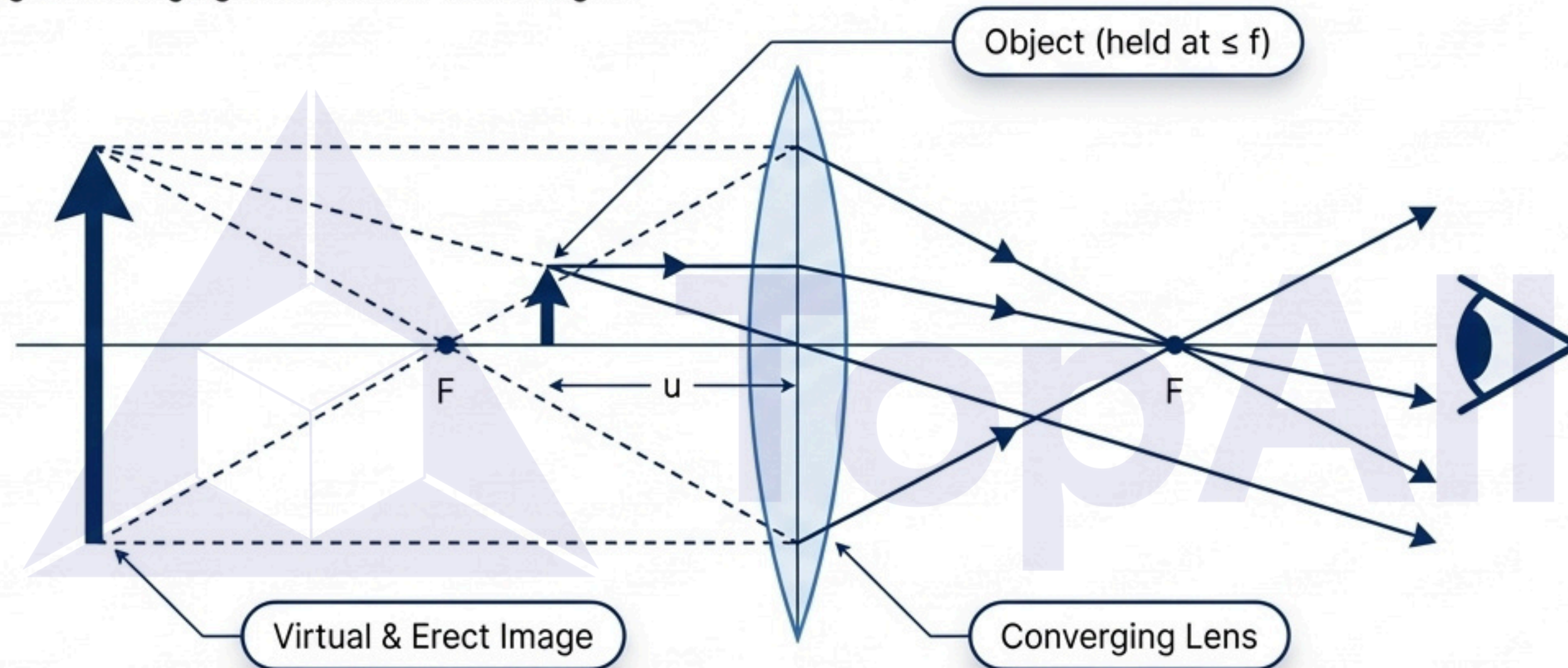
Object at 25 cm



If brought **closer than D**, the eye cannot focus and strains. A magnifying lens allows us to bring the object **closer than D** while keeping the image in **sharp focus**.

The Simple Microscope

A single converging lens of small focal length.



The lens allows the eye to view an object placed closer than the near point, forming a magnified, virtual image at a comfortable viewing distance.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

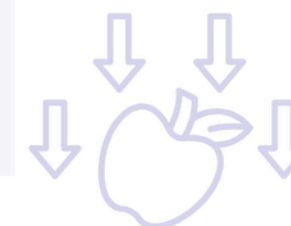
Practice Now



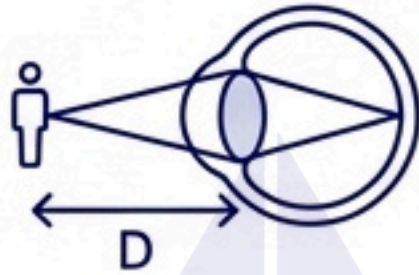
At prep.topall.app

Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



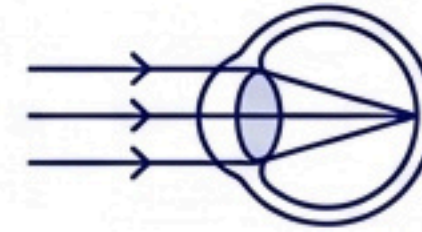
Viewing States: Strain vs. Relaxation



Maximum Magnification

- Image formed exactly at D (25 cm).
- Maximum magnification achieved.

Trade-off: Causes eye strain.



Relaxed Viewing

- Object placed exactly at focal point f.
- Image formed at infinity.

Benefit: Viewed by a relaxed eye.

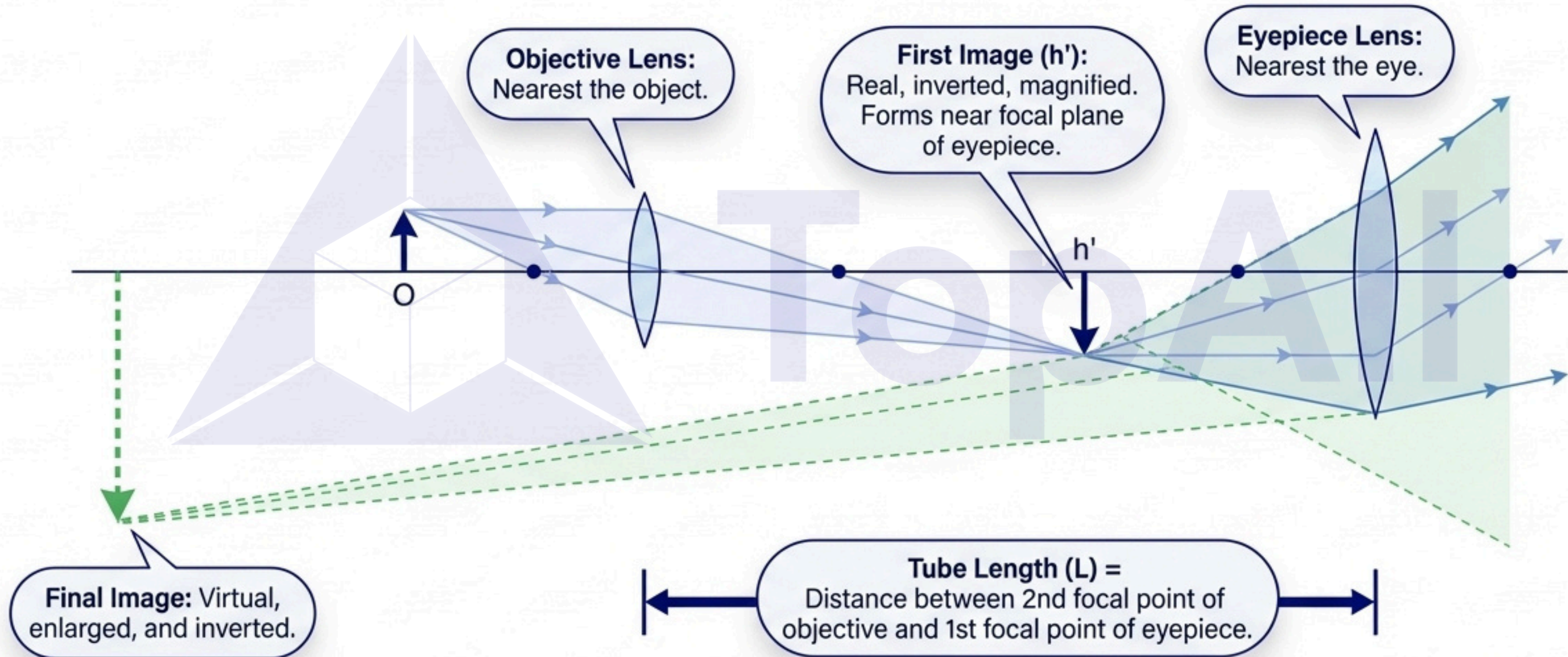
Formula Highlight Card

Near Point Magnification: $m = 1 + (D / f)$

Infinity Magnification: $m = D / f$

The Compound Microscope

Simple microscopes max out at $m \leq 9$.
Compound systems use two lenses to multiply magnification.



Lens Roles & Total Magnifying Power

The Objective

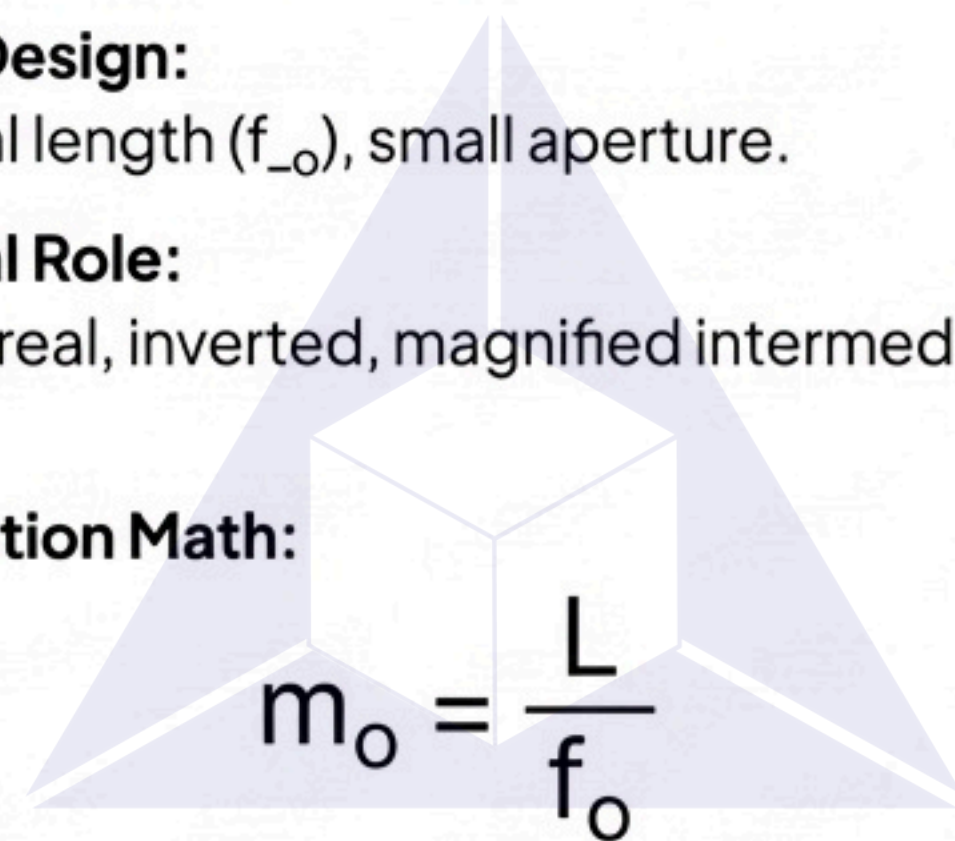
Physical Design:

Small focal length (f_o), small aperture.

Functional Role:

Creates a real, inverted, magnified intermediate image.

Magnification Math:


$$m_o = \frac{L}{f_o}$$

The Eyepiece

Physical Design:

Functions precisely as a simple magnifier.

Functional Role:

Takes the intermediate image and creates the final virtual, enlarged image.

Magnification Math:

$$m_e = 1 + \frac{D}{f_e} \text{ or } \frac{D}{f_e}$$

Total Magnification: $m = m_o \times m_e$

At Infinity: $m = (L / f_o) \times (D / f_e)$

Key Takeaways: The Microscope

- ✓ **Simple Microscope:** A single converging lens (f is small) allowing an object to be viewed closer than 25 cm. Max magnification is $1 + (D/f)$ at the near point.
- ✓ **Infinity Viewing:** Placing the object exactly at f creates an image at infinity, offering relaxed viewing at slightly less magnification (D/f).
- ✓ **Compound Microscope:** Uses two lenses to break the magnification limit of a simple lens. Total magnification is the product of both lenses ($m = m_o \times m_e$).
- ✓ **Lens Design Rule:** To achieve high compound magnification, both the objective and eyepiece must have very small focal lengths (f_o, f_e).



You've Learned the Theory.

Now Let's Test It.

Reading notes gets you knowledge.

Practicing MCQs gets you marks.

That's exactly what TopAll Pro is built for.

Try TopAll Pro Now

What TopAll Pro Does Differently

-  **Stuck? Snap it. Solve it. — Doubts AI**
Photo → step-by-step solution in seconds, 24/7
-  **Your AI Coach finds your blind spots**
Concept-level weakness detection — not just chapter-level
-  **4.5 Lakh+ questions. Never run out.**
13× more content than any other prep app in India
-  **Build your own test in 60 seconds**
Pick a chapter, set difficulty — AI does the rest instantly.
-  **AI Recommendation that helps you improve**
AI Recommendation Analysis your Tests and tell you where you need to improve.



Practice the moment you finish studying
Jump in while the concept is still fresh in your head

4.5L+
MCQs

1.5L+
Students

AI Powered
In-Depth Analysis