SIMON

SIMON Fundic Exam Simulator (Human)

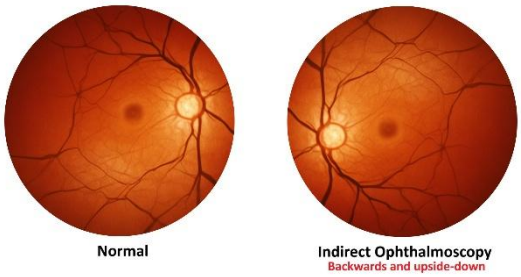
Information Packet

Before you start…

Indirect ophthalmoscopy (also called a "fundic exam") allows us to visualize the fundus.

The "fundus" refers to the "back of the eye", which contains the retina and the optic disc.

Crucial Concept #1 – With indirect ophthalmoscopy, the ophthalmic lens results in your image being "reversed and inverted" (in other words, "backwards and upside down").



This is important to understand because the image you see through the lens is not actually how the fundus is oriented in the person's eye. For example, a person's optic disc sits medially (towards midline) in the retina. However, on indirect ophthalmoscopy, the optic disc appears more laterally (away from midline), because the image is inverted, as well as backwards. **This concept is depicted below.**

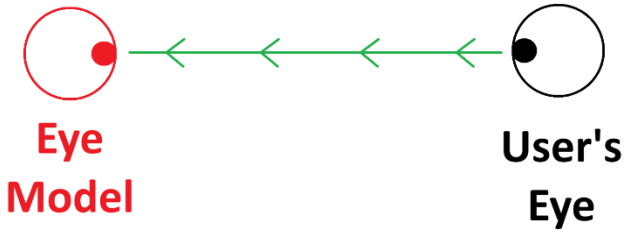
Crucial Concept #2 - The pupil is not a solid object, it's actually a hole! Consider it the "entrance into the eye". While performing a fundic exam, the pupil is what we look through and allows us to visualize the fundus.

Above all, keep in mind that even the most experienced doctors struggle with fundic exams. Mastering this diagnostic technique takes a lot of practice and gets even harder when you perform it on a real patient! For those reasons, when learning this

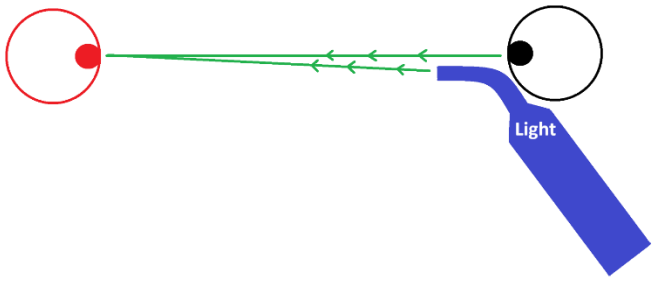
skill, just be patient with yourself. It will come with time! Experiment with different angles and distances to see what works best for you.

<u>How to perform Indirect Ophthalmoscopy (AKA a "fundic exam")</u>

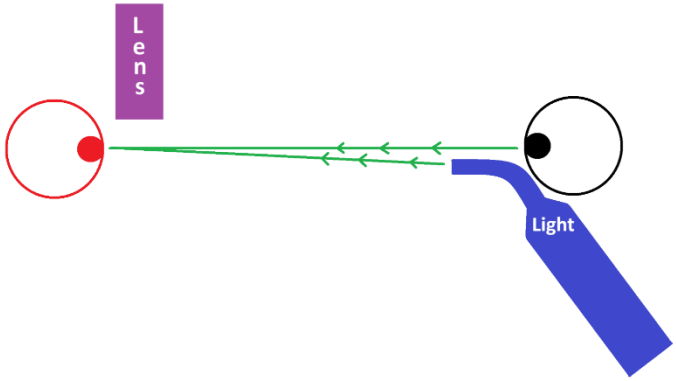
- To start, position yourself directly in front of the eye model that you wish to visualize.



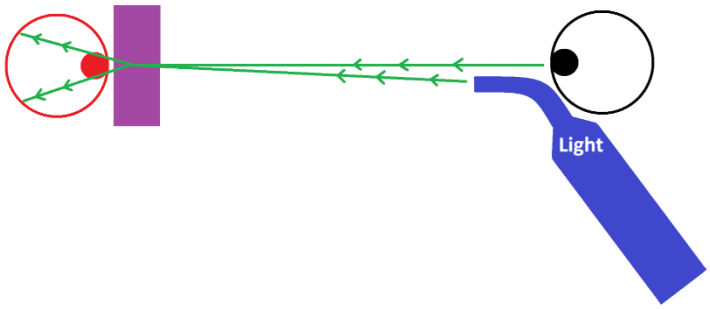
- Using your right hand, position the ophthalmic light directly beneath your own eye, such that the light beam shines directly into the pupil of the eye model.



- Using your left hand, hold the 20D ophthalmic lens just above the eye model with your thumb and pointer finger.

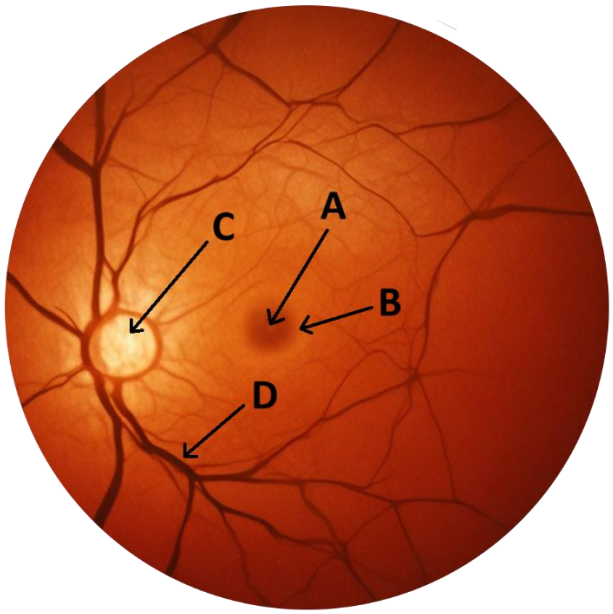


- As you shine the light into the pupil, once you see a glimpse of green at the back of the eye, move the lens down and directly in front of the pupil of the eye model. There should be about an inch of space between the eye model and your lens.



<u>Common Problems & How To Fix Them…</u>

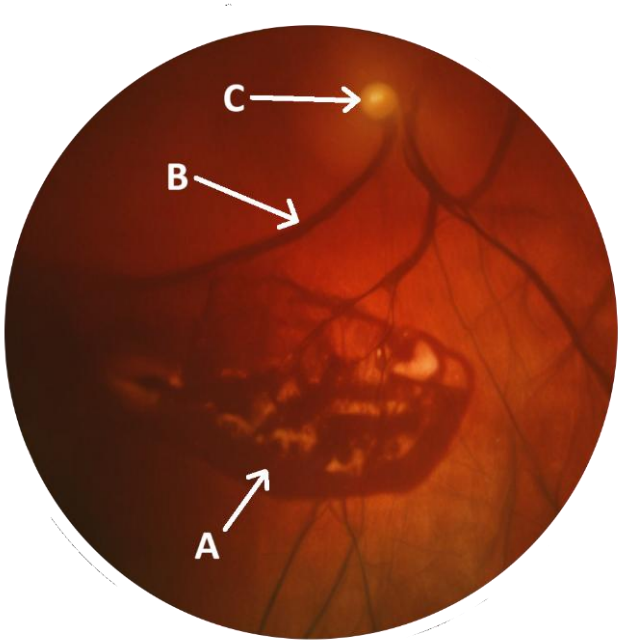
- If the lens is positioned correctly, a magnified view of the retina will appear in your lens.
    - **If the fundus appears too large and/or distorted**, try moving the lens further away from the eye.
    - **If the fundus appears too small,** try moving the lens closer to the eye.
    - **If the fundus appears too bright or "shiny"**, try moving the light source (and yourself) further away from the eye.
    - **If you only see a piece of the fundus**, try moving your lens "up and down" or "side to side" to centralize the image.
    - Once you have a good view of the fundus, explore the full fundus by rotating the light, the lens, and yourself together around the eye (while keeping them in line with each other).
        - However, keep in mind the "inverse and backwards" rule still applies, so moving left will show you more of the right side, moving up will show you more of the bottom, etc.



Eyeball #1 – Normal

In a human, this is how the fundus should normally look on indirect ophthalmoscopy.

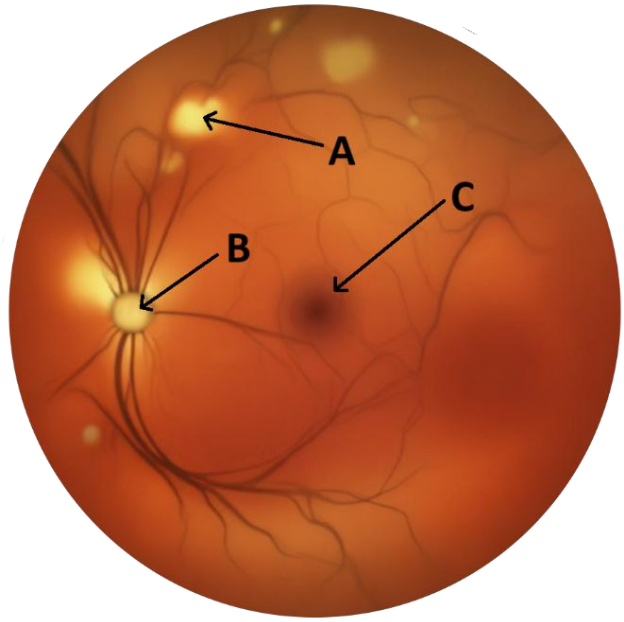
- The fovea **(A)** is a small "pit" containing a high number of cone photoreceptors, surrounded by a flat region known as the macula **(B)**. These two structures together are responsible for centralized vision (AKA objects you are looking directly at), along with color perception and creating a sharp, detailed image.
- The optic disc **(C)** is where the optic nerve exits the eye to transmit visual information from the retina to the brain. Normally, it should appear smooth, round, and well-defined.
- The optic vessels **(D)** provide nutrients and oxygen to the eye. Normally, they should appear thin and travel in a smooth direction.



Eyeball #2 – Retinal Hemorrhage

When retinal vessels become damaged, they can sometimes leak or rupture, leading to the appearance of retinal hemorrhage.

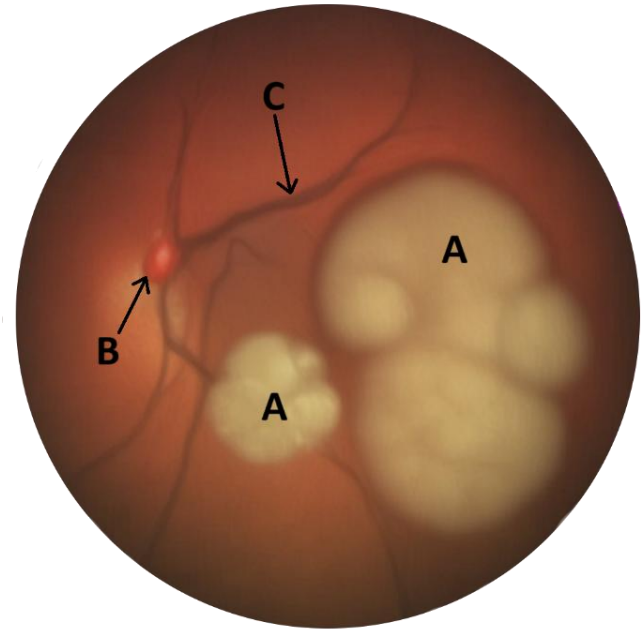
- Areas of severe hemorrhage **(A)** can be seen on the fundus, characterized by "red pools" of various shapes and sizes.
- Depending on the cause, retinal vessels **(B)** may appear thickened.
- For reference, the optic disc **(C)** is labeled.
- Differentials for this condition include:
    - Systemic hypertension
    - Platelet disorders
    - Clotting factor disorders
    - Von Willebrand's Disease
    - Trauma
    - Infections leading to vasculitis (bacterial, viral, etc.)



Eyeball #3 – Diabetic Retinopathy

Humans with diabetes have high levels of glucose in their blood. This can lead to a number of problems, including vascular damage, allowing for the leakage of fluid and lipid into the retina. When diabetes goes untreated, the lipid begins to accumulate in small clusters within the eye, creating the classic appearance seen in the picture above.

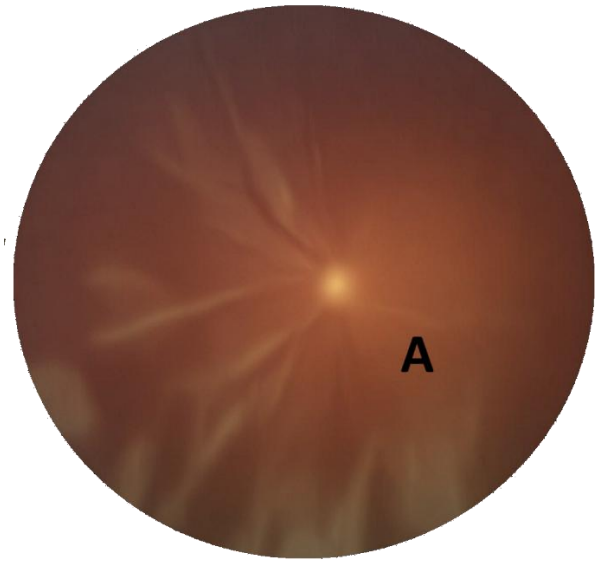
- Lipid (or "fatty") clusters **(A)** within the retina.
- For reference, the optic disc **(B)** along with the macula **(C)** is labeled.
- Important to note, diabetes can also result in the development of cataracts (also known as "lenticular opacification"). Depending on the degree of severity, cataracts can make fundic examination difficult, or even impossible!

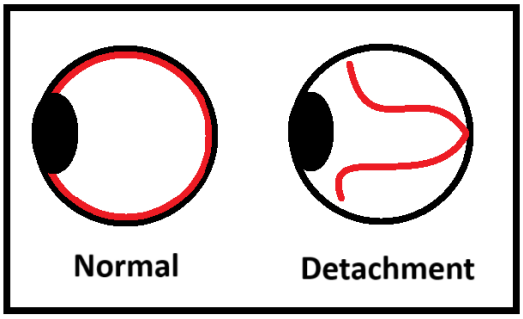


Eyeball #4 – Retinoblastoma

Retinoblastoma is the most common malignant tumor in children, but overall it is thankfully very rare (1 in every 15,000 children is affected). This tumor results from a mutation on the RB1 gene within chromosome 13. This mutation leads to uncontrolled cellular growth within the retina, creating a very classic appearance on fundic exam.

- Tumors **(A)** within the retina, which can appear as one or multiple round, light-colored masses.
- For reference, the optic disc **(B)** and retinal vessels **(C)** are labeled.





Eyeball #5 – Retinal Detachment

Normally, the retina is a thin layer that sticks to the inner wall of the globe **(shown above, retina is drawn in red)**. However, certain things can cause the retina to fall off, creating a very characteristic appearance on fundic exam that can sometimes be confusing to interpret. Retinal detachments can either be partial or complete. With partial detachment, some of the fundus may appear normal, with other parts appearing blurry. With complete detachments, as depicted above, there is no normal fundus to be seen.

- The optic disc **(A)** is the only visible structure above. The rest of the fundus appears "blurry and discolored" due to the retina being detached and free-floating within the globe.
- Differentials for this condition include:
    - Hypertension
    - Trauma
    - Age-related
    - Genetic predisposition
    - Posterior uveitis
    - Ocular tumors