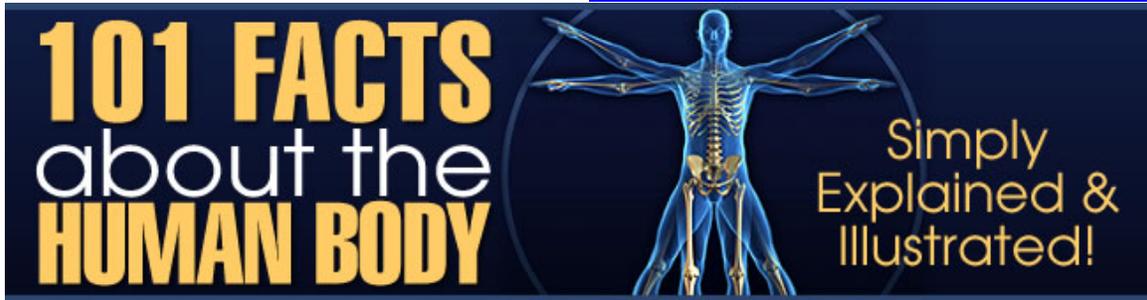


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101 Facts About the Human Body Simply Explained and Illustrated!

By Radhika Venkata

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About the Author

Dr. Radhika is a Pathologist by profession and likes to share her medical knowledge with others.

She loves to spend time with family and her computer.

She used many of the questions asked by her own two children as the basis for this, her third book published by eBookwholesaler.

She wrote '101 Facts About the Human Body - Simply Explained and Illustrated!' for you to learn from and to share with your children, so that they have accurate information to help them be comfortable with their own bodies and understand why it is so important to eat the right foods, exercise and generally look after themselves.

Dr Radhika has also studied Web design using the php/MySQL language. Dr Radhika has also studied Web design using the php/MySQL language. Her current project is her website, <http://www.pathology-world.com/>

Dr Radhika's favorite saying is, "God doesn't require us to succeed; he only requires that you try" - *Mother Teresa*

Part I: Our Senses

Our Eyes and Vision

Why do we have to constantly blink our eyes?

We blink our eyes about once every five to seven seconds. Mostly, we don't even know that we are blinking our eyes.

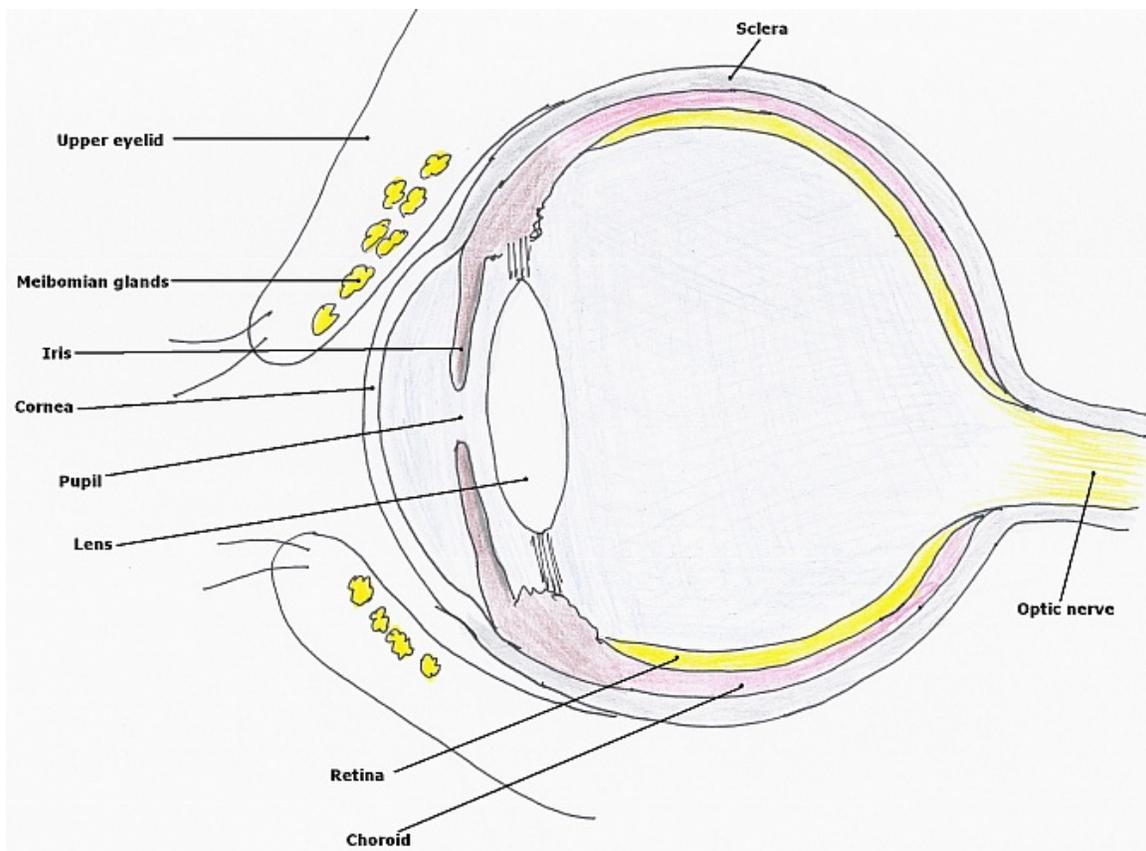
If you deliberately keep your eyes wide open for a few minutes and stop yourself blinking, your eyes will start to feel like they are dry after a while. You will feel this dryness when you are watching your TV or computer and forget to blink.

If you do not blink, then your eyelids cannot smear the tears from lacrimal glands and oily secretions from your 'meibomian glands' over the eyeballs to keep them moist.

There are some glands called 'meibomian glands' under your eyelids. The oily secretions from these glands mix with tears and keep a moist layer on the eyes.

This moist layer prevents the surface of your eyes becoming dry. If the eyes are dry, the conjunctiva (white part of the eye) and the cornea (black area in the centre of your eye) may become damaged and get infected.

Also, when we blink, the eyes are protected from dust being deposited on our eyes.



You can see the tiny meibomian glands in both the upper and lower eyelids in my picture. There are more in the upper eyelid.

They keep the eyes moisturized by producing an oily secretion and releasing it onto the eye through tiny ducts.

What happens to the eyes when they are dry? When the conjunctiva and cornea remain dry for some time, small areas of the surface become eroded. If not treated, they will get infected. When the eyes get dry and don't get any tears or secretions, it is called 'xerosis'.

If you stay in open places where there is lot of wind, you need to blink more often than usual to stop the drying effect of the wind on your eyes.

Can our Eye be compared to a Camera?

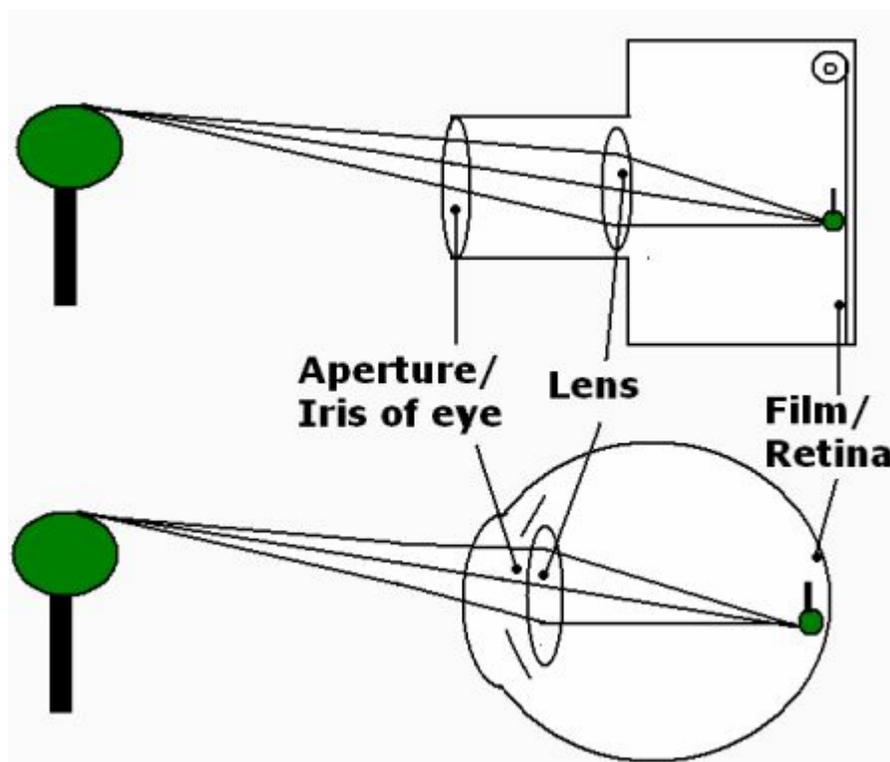
When you go to a picnic or a party, you might take your camera with you to get pictures of you and your friends. Right?

But, do you know you have TWO CAMERAS in your body?

They are your eyes! Each eye acts like a camera. In the same way that you

focus your camera on the subject and click the button to get the image on the film, you focus your eye on the subject and get the image on the retina.

Here is a picture that compares the parts of human eye with a camera:



In the picture, both your eye and your camera focus on the object and get the picture on to the retina (eye) or screen (camera).

1. Light coming from the subject into the camera and eye.
2. Light passing through the camera opening and pupil of the eye.
3. The lens of the camera and the lens of the eye focus the image on to the screen and retina respectively.
4. A picture is created on the film and the retina. This picture will be small and inverted (upside down).

Comparing camera and eye:

Pupil of the eye = Opening of the camera (Light passes through)

Lens of the eye = Lens of the camera (Focuses on the subject. We adjust the camera lens. The lens in the eye is adjusted by the process called 'accommodation')

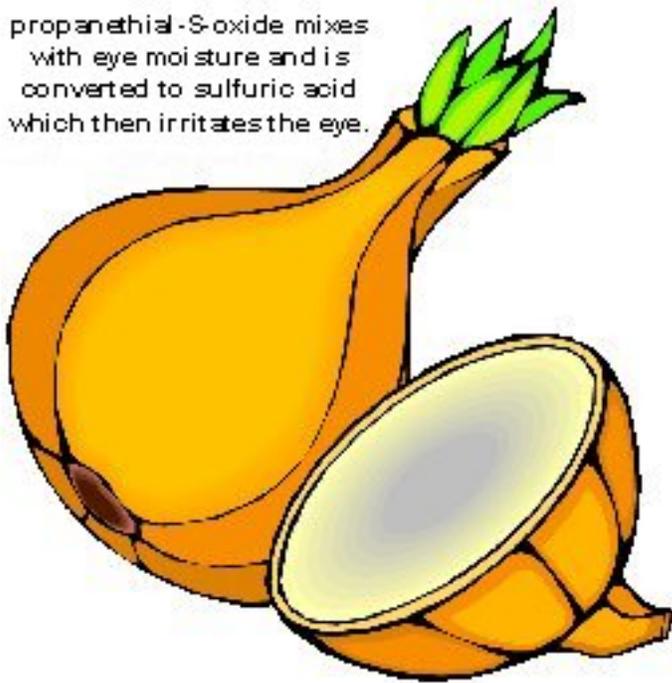
Retina of the eye = Film of the camera (Picture image is created)

Why do our eyes water when we cut onions?

There are sulphur compounds in the onion which irritate our eyes.

When we cut the onions, we damage the cells of the onion. The Synthase enzyme in the onion cells comes in contact with amino acids called

propanethiol-S-oxide mixes with eye moisture and is converted to sulfuric acid which then irritates the eye.



sulfoxides. These sulfoxides are converted into Sulfenic acid.

This unstable sulfenic acid changes to propanethiol-S-oxide gas which forms mild sulphuric acid when it mixes with the moisture in our eyes. This acid irritates the eye and our lacrimal glands produce tears to wash out this irritant.

To reduce the irritation, wash your onions under water.

Why can't we see well when we go from bright light to a dark room?

Our eyes have two types of receptors in the retina.

1] Cones for seeing color. When we go into a lighted area, the cones provide our vision; the colors and the objects are bright. This type of vision by the cones is called '**Photopic vision**'.

2] Rods for night vision. When we are in a dark area, the rods provide vision called '**Scotopic vision**'; we see things as grey or black and cannot appreciate the details or colors of objects in the dark.

When we move from bright light to a dark area, we can't see very well for a while because the rods adapt more slowly than the cones. It may take from 25 to 60 minutes for the rods to get their full functionality.

So, it will take few minutes for us to see well in the dark. This is called '**Dark adaptation**'.

But, cones get to work more quickly. If we move from a dark area to a light area, most people can see well almost instantly.

Why are people with Color blindness advised not to drive vehicles?

A person with color blindness cannot recognize certain colors. The most common color blindness is 'red-green color' blindness. Nine percent of the male population has some sort of red-green blindness.

Red-green blindness is inherited as an 'X-linked' disorder. This means that it only occurs in the male.

An ophthalmologist uses a set of color plates, called Ishihara Charts, to detect color blindness. With most of the pictures, people that have normal vision see a particular number in the chart. When someone gets a different result from looking at the plates, the specialist can work out what type of color blindness the patient is showing.

If people have a problem with color differentiation of red and green, it will be difficult for them to see the colors of traffic lights.

Some people think that they can compensate for that deficiency because they are familiar with the position of the lights; red on the top, yellow in the middle and green at the bottom. If the intensity of the light changes, then they will know which traffic light changed.

But, it would be dangerous for them to drive when away from their original surroundings or under stress, and they would be a risk to other drivers too.

Can we walk straight with our eyes closed?

Probably not, unless the person is trained to do so.

A person's balance depends on three factors.

1. **Vision:** Vision helps us to adjust our body to the environment. We use our eyes to see the objects, set a target and direct ourselves on a straight path.
2. **Inner ear:** There is a part called 'vestibular apparatus' in the inner

ear. It maintains the body balance by sending information of our body position with respect to gravity.

3. **Proprioceptors:** There are many receptors in our joints, ligaments and muscles. These receptors send signals to the brain continuously so that we know the position of our body parts in relation to each other.

These three factors work together to maintain our body balance so we don't fall or do any un-coordinated movements.

Why can't we walk straight?

If any of the above three systems are damaged or not used, the person tends to sway from the straight line. For example, if a person closes his eyes, they cannot walk straight unless they have had special training. Most people tend to move towards the right side of the straight line if they close their eyes and try to walk straight.

How do our eyes interpret a moving object in a movie?

How can our eyes see a person moving on a TV screen or in a movie theatre screen even when the film strip has still images of the person?

This effect is called 'critical fusion frequency'. (Ref. Ganong - Physiology).

Critical fusion frequency is the rate at which the frames of a film are interpreted as separate images. When the images are displayed to you more rapidly, you no longer perceive separate frames and the object seems to be in continuous motion.

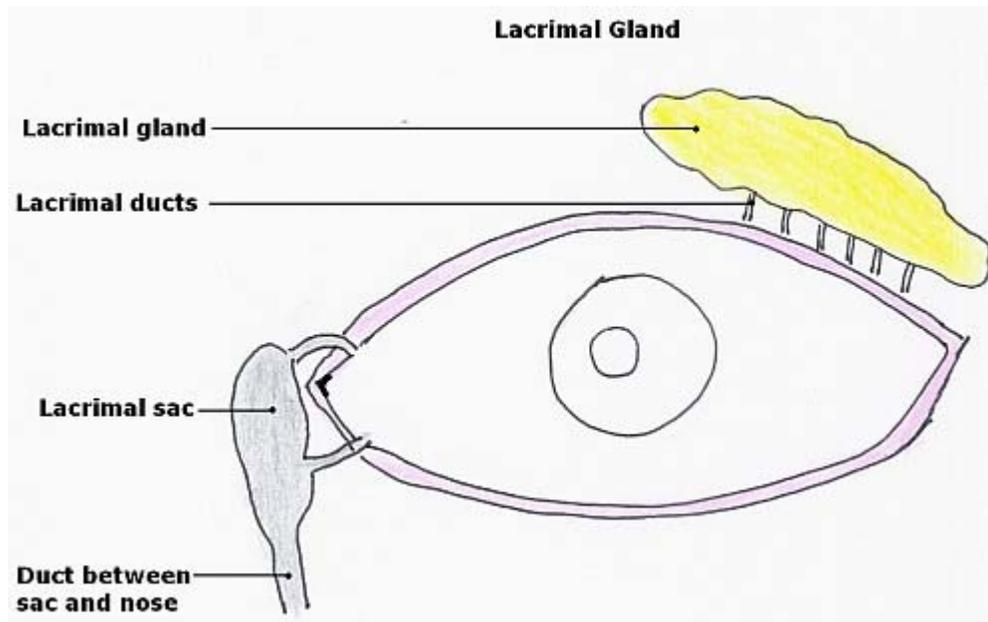
This principle is used to make movies. The normal rate is 24 frames per second. If we see 24 frames showing a puppy in one second, we will appreciate them separately. If we see 50 photos of a puppy in one second, the retina cannot separate them, so it looks like the puppy is moving.

Where do we get the water for our tears when we cry?

When a person cries or if he laughs too much, tears comes out of the eyes. Where are they coming from?

There are small glands called 'lacrimal glands' on the outer top corner of the

eye. These glands actually produce tears and store them there. When we cry, the muscles around these glands squeeze the glands. The tears are secreted through the fine duct over the eye.



Lacrimal gland that produces tears.

Why are tears useful?

With every blink, tears are spread over the eye surface of our eyes from our lacrimal glands. This keeps the cornea moist and prevents it from drying.

Tears have anti-bacterial properties which keeps the germs away from the eye surface.

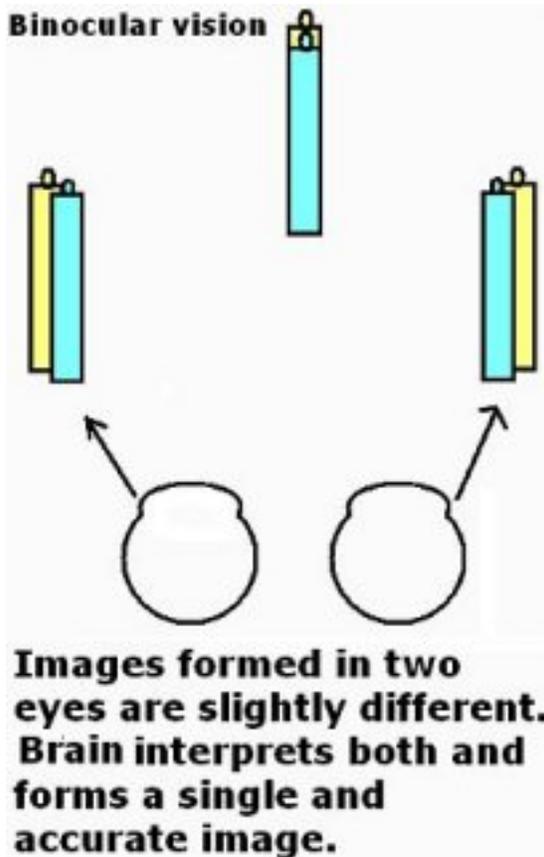
Is crying necessary?

Scientists have been doing research on crying for many years, asking questions like;

what are the brain pathways controlling crying?

Why and how has crying developed?

One benefit that is well known is that many people feel calm and relaxed after they cry.



What is the advantage of having two eyes?

Looking with two eyes is called 'Binocular vision'. ('bi' means two, 'ocular' means eyes). Put a pencil down on the table in front of you. Gently close only your right eye and look at the pencil.

Now, without moving your head or the pencil, open your right eye and gently close only your left eye.

When you do this properly, it will seem like the pencil appears in a different position when seen by each of your eyes.

Now open your both eyes and look at the pencil. Your brain uses the slightly

different image from each of your eyes to locate the pencil's position as accurately as possible.

When the brain receives two images from the two retinas (when both eyes are open), it processes both images and interprets the depth and distance of the object correctly. If one eye is closed, the brain receives only one image from one retina and doesn't have a second image to compare it with. Then, how you see the object is how it looks in that single field.

People who have poor sight in one of their eyes have difficulties with pouring coffee into the cup, picking things up, etc. Binocular vision helps you to know the position of the object correctly.

How do our eyes distinguish different colors?

What happens if we can't appreciate or distinguish different colors?

Everything looks grey, like a black and white movie.

There is a thin layer called the 'retina' at the back of our eyes. The retina has

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