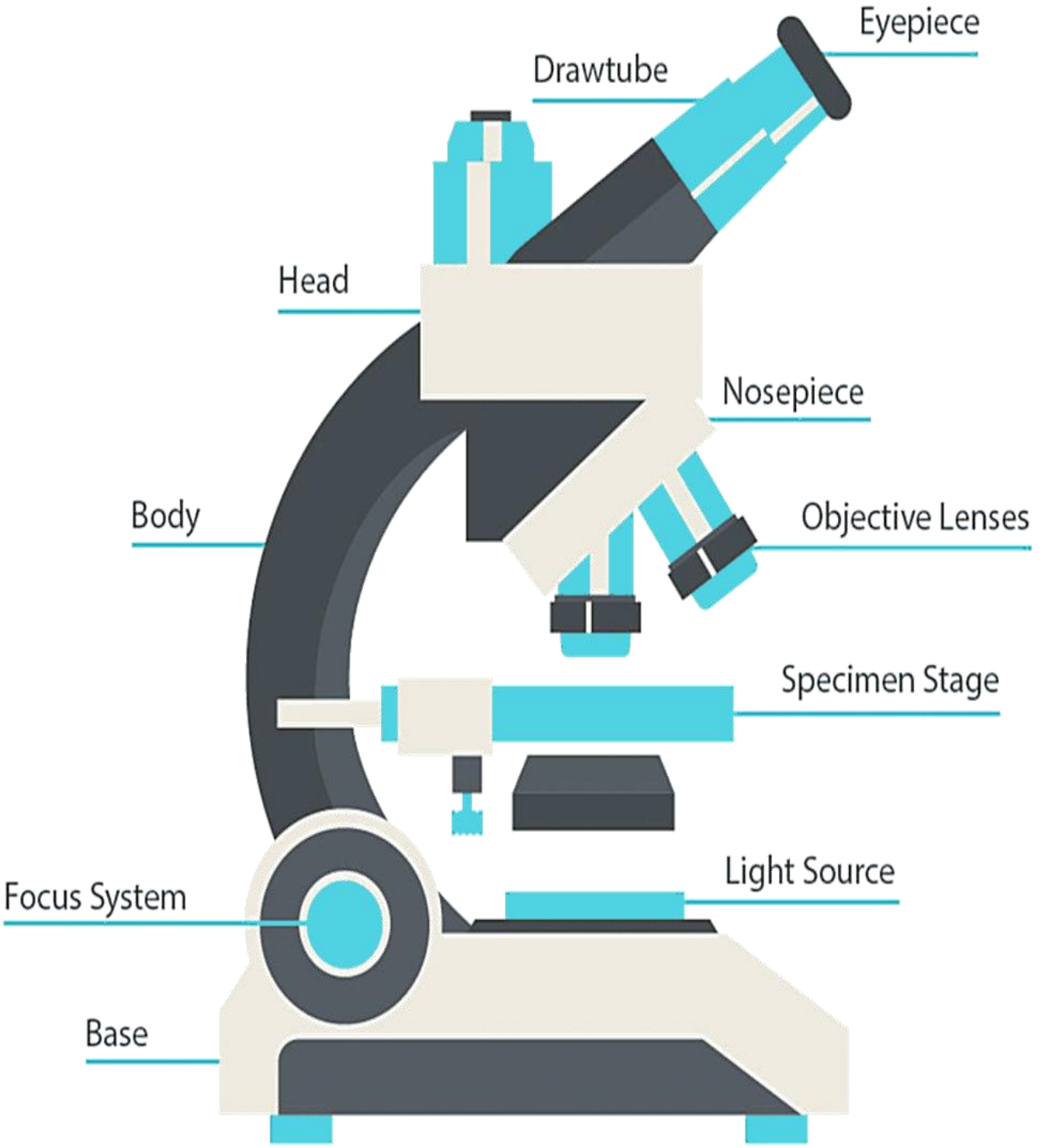
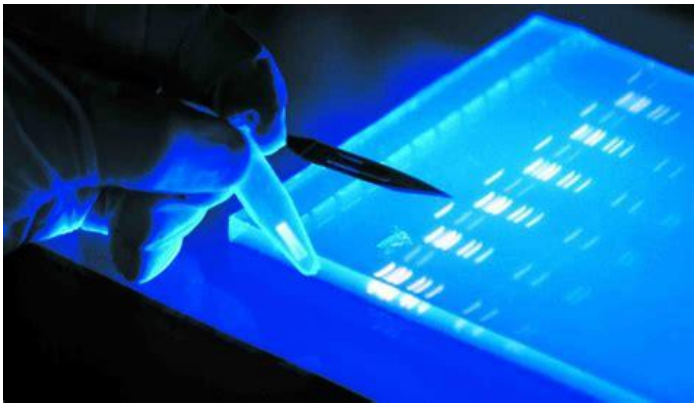
Anatomy of a Microscope

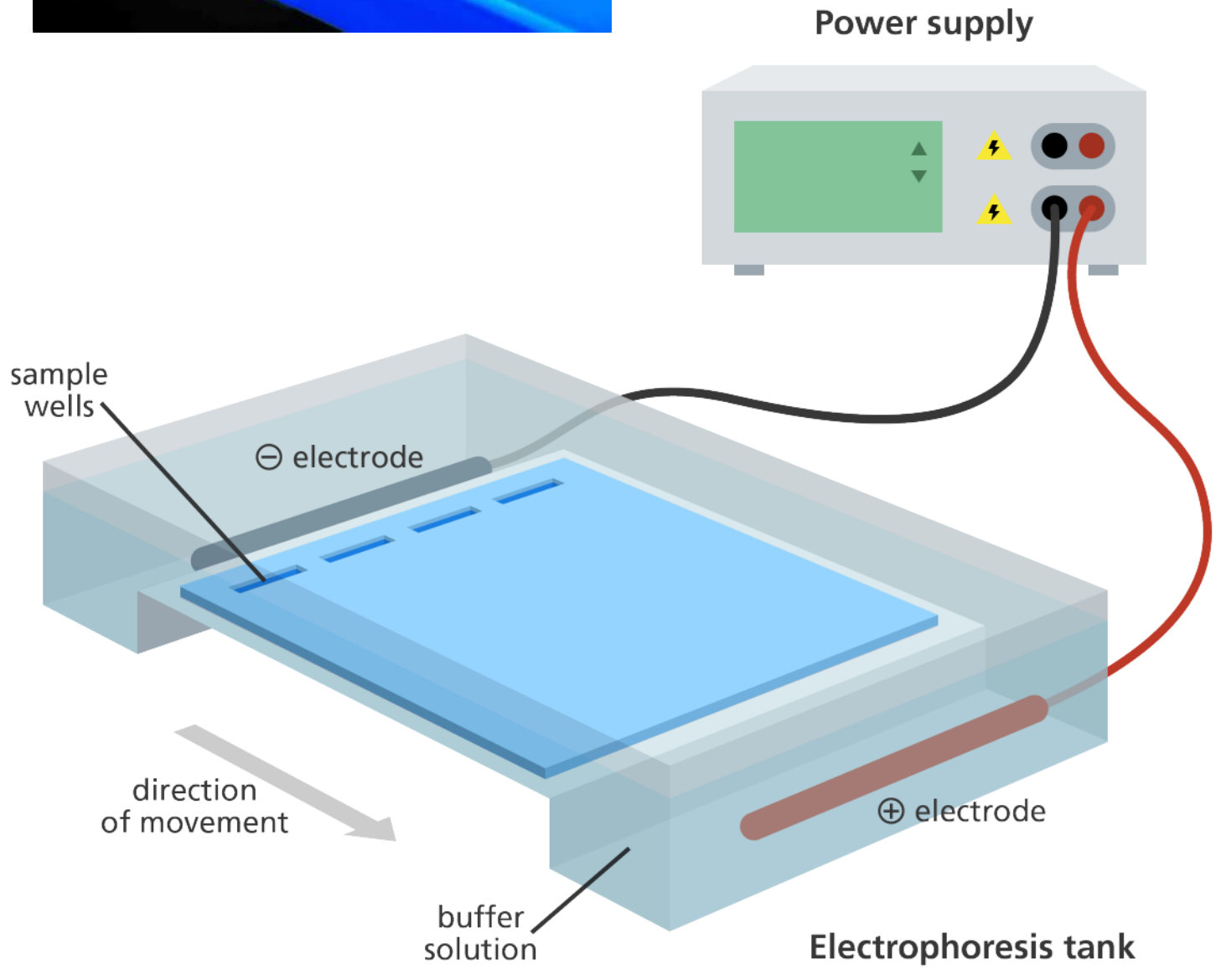


Candy Cells Models

	Candy	Organelle It Represents
	Fried Egg Candy	Nucleus
	Jelly Beans	Mitochondria
	Licorice Laces	Endoplasmic Reticulum (ER)
	Nerds	Ribosomes
	Raspberry Gummies	Golgi Apparatus
	Sprinkles	Lysosomes

Gel Electrophoresis





ACIDS, ALKALIS, AND THE pH SCALE

The pH scale is a way of gauging the acidity or alkalinity of a solution. It is calculated using: $pH = -\log_{10}[H^+]$. Adding an acid to water increases the H^+ (H_3O^+) concentration, and decreases the OH^- concentration. An alkali does the opposite.

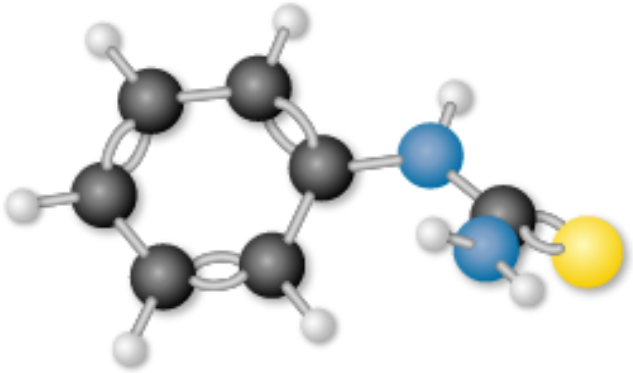
pH	H^+ CONCENTRATION (in moles per litre)	OH^- CONCENTRATION (in moles per litre)	EVERYDAY EXAMPLE
14	1×10^{-14}	1	Drain Cleaner 
13	1×10^{-13}	0.1	Bleach 
12	1×10^{-12}	0.01	Ammonia 
11	1×10^{-11}	0.001	Soap 
10	1×10^{-10}	1×10^{-4}	Antacid Tablets 
9	1×10^{-9}	1×10^{-5}	Baking Soda 
8	1×10^{-8}	1×10^{-6}	Seawater 
7	1×10^{-7}	1×10^{-7}	Pure Water 
6	1×10^{-6}	1×10^{-8}	Urine (average) 
5	1×10^{-5}	1×10^{-9}	Black Coffee 
4	1×10^{-4}	1×10^{-10}	Tomato Juice 
3	0.001	1×10^{-11}	Soda 
2	0.01	1×10^{-12}	Lemon Juice 
1	0.1	1×10^{-13}	Stomach Acid 
0	1	1×10^{-14}	Battery Acid 

ALKALINE (Purple → Blue → Turquoise)

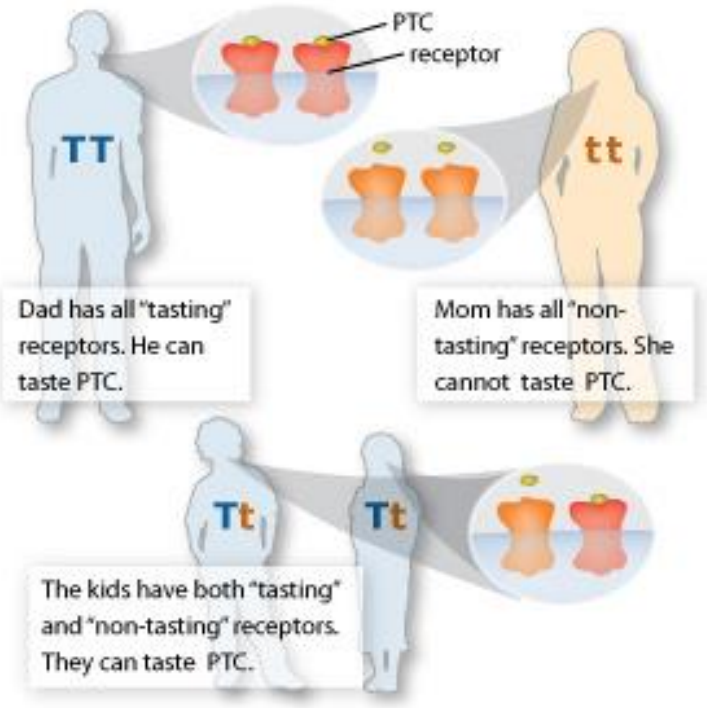
NEUTRAL (Green)

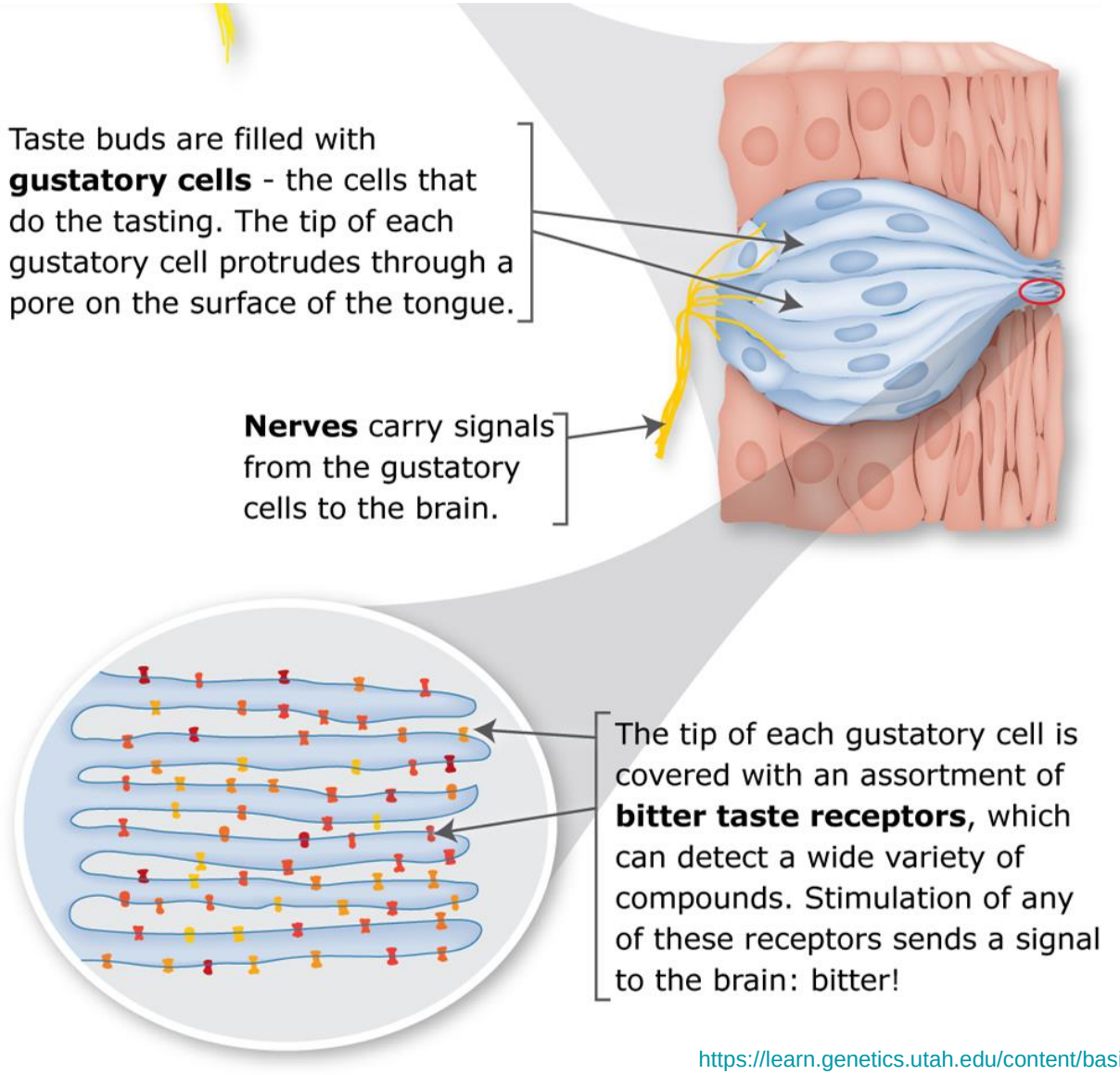
ACIDIC (Yellow → Orange → Red)

PTC Testing



PTC stands for phenylthiocarbamide. Also known as phenylthiourea, the chemical structure of PTC resembles toxic alkaloids found in some poisonous plants.

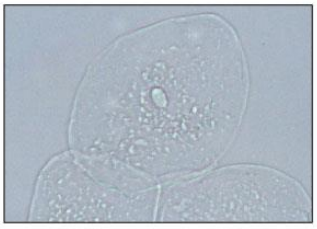
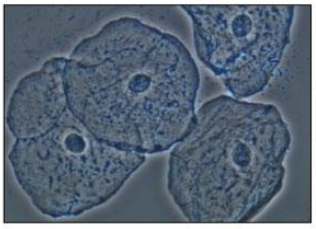
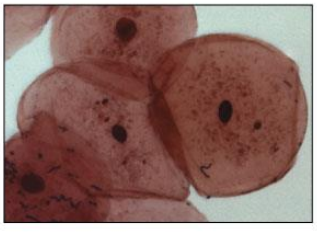
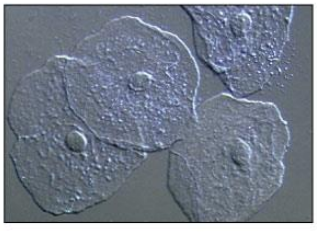
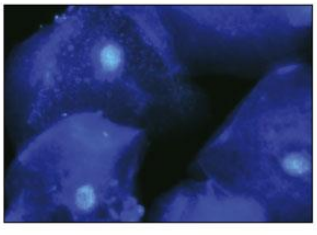
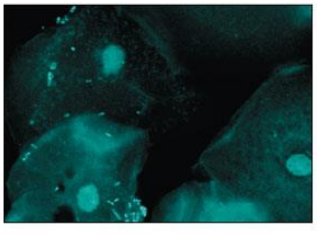




https://learn.genetics.utah.edu/content/basics/ptc/

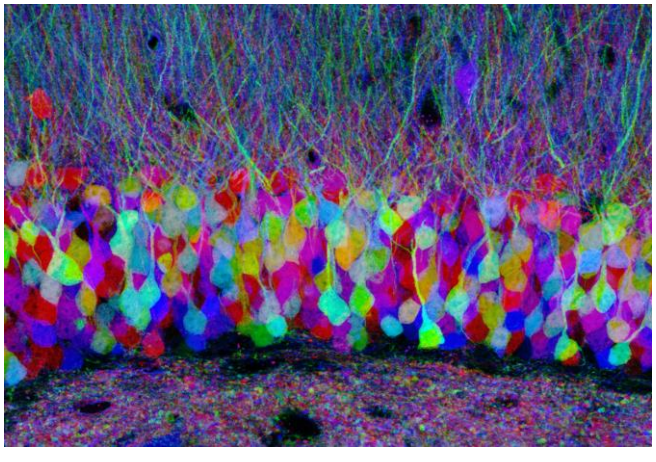
Microscopy

Table 1-1 **Different Types of Light Microscopy: A Comparison**

Type of Microscopy	Light Micrographs of Human Cheek Epithelial Cells		Type of Microscopy
Brightfield (unstained specimen): Passes light directly through specimen; unless cell is naturally pigmented or artificially stained, image has little contrast.			**Phase contrast:** Enhances contrast in unstained cells by amplifying variations in refractive index within specimen; especially useful for examining living, unpigmented cells.
Brightfield (stained specimen): Staining with various dyes enhances contrast, but most staining procedures require that cells be fixed (preserved).			**Differential interference contrast:** Also uses optical modifications to exaggerate differences in refractive index.
Fluorescence: Shows the locations of specific molecules in the cell. Fluorescent substances absorb ultraviolet radiation and emit visible light. The fluorescing molecules may occur naturally in the specimen but more often are made by tagging the molecules of interest with fluorescent dyes or antibodies.			**Confocal:** Uses lasers and special optics to focus illuminating beam on a single plane within the specimen. Only those regions within a narrow depth of focus are imaged. Regions above and below the selected plane of view appear black rather than blurry.

20 μm

Source: Adapted from Campbell and Reece, *Biology,* 6th ed. (San Francisco: Benjamin Cummings, 2002), p. 110.



"BRAINBOW" mouse neurons labeled with fluorescent markers and imaged using confocal microscopy..
Geoff Lichtman/Harvard