Our goal for the project is to create photodiodes which receive signals with minimal noise. A photodiode operates similarly to a regular diode (same modeling) except that there is an additional signal from light/photons, the **photocurrent i_p**, which shifts the I-V curve downward. In the absence of light, the photodiode operates as a regular diode and has a **dark current I_D.**

- In other words, the dark current & the photocurrent are considered in a photodiode, but the photocurrent is the signal we are interested in observing.

We have a few objectives regarding the photocurrent:

1. Create the following types of photodiodes:
    a. Regular Photodiode
    b. Quadrant Photodiode
    c. Balanced Photodiode
    d. Auto-balanced Photodiode
2. When we create these diodes, we have to consider the following issues:
    a. Dark Current (we need to remove this “noise” in the circuit)
    b. Remove other wavelengths of light

Since the photodiode operates similarly to a regular diode, we can use the three standard models in our circuit analysis:

1. **Exponential Model**
    a. Most difficult model to use
    b. Most accurate model outside the breakdown region
2. **Constant Voltage Drop Model**
    a. Zero Diode Current
    b. Most commonly used & Simplest!
    c. .7 Forward Voltage Drop
3. **The ideal-diode model**
    a. Better for voltages much greater than the diode voltage drop (0.6-0.8V), or the voltage drop, $\mathbf{V_D = 0}$
    b. Greatest use is to determine **which diodes are on/off**

No need to consider the reverse-bias voltage/characteristics.

Transimpedance Amplifier:

- Current to Voltage Converter, implemented with one or more amplifiers
- Most likely used to convert photodiode current to voltage

To what level are we developing the photodiode?