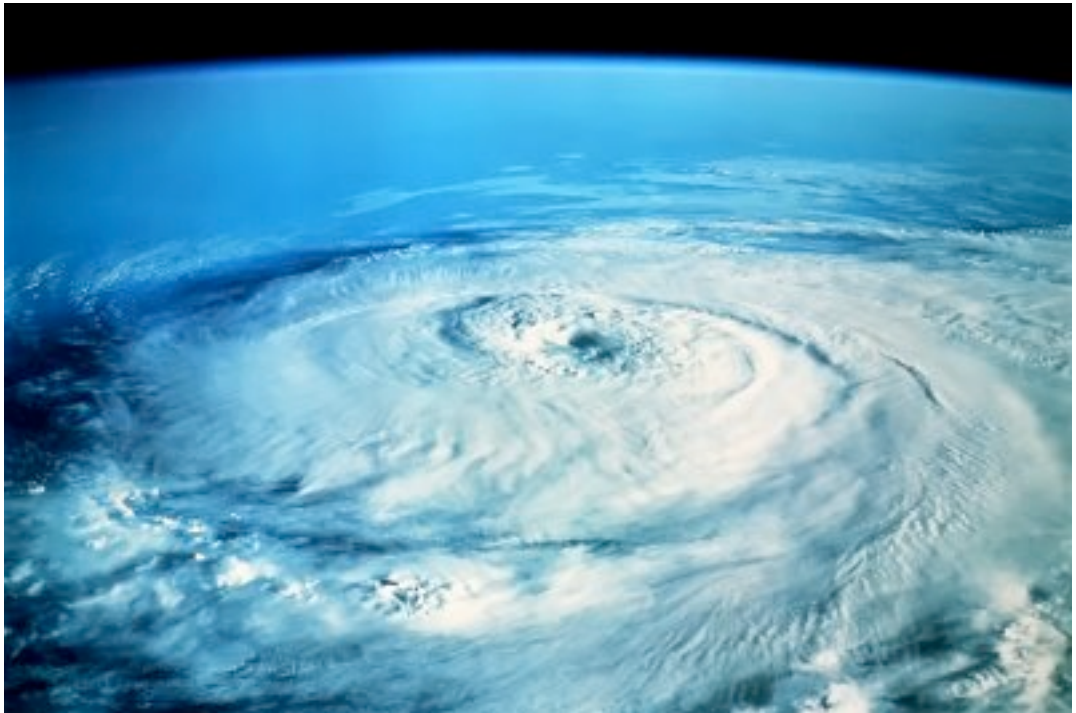
YAAYS Course #4 "Building Instruments"

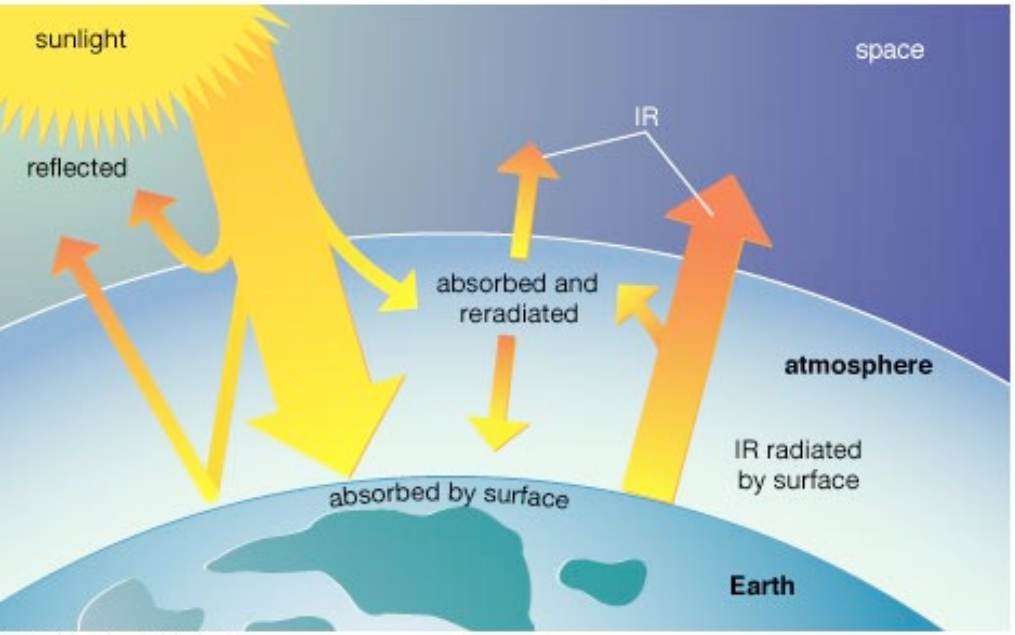
Ultraviolet Sensor **(lead: Rich Kron)**

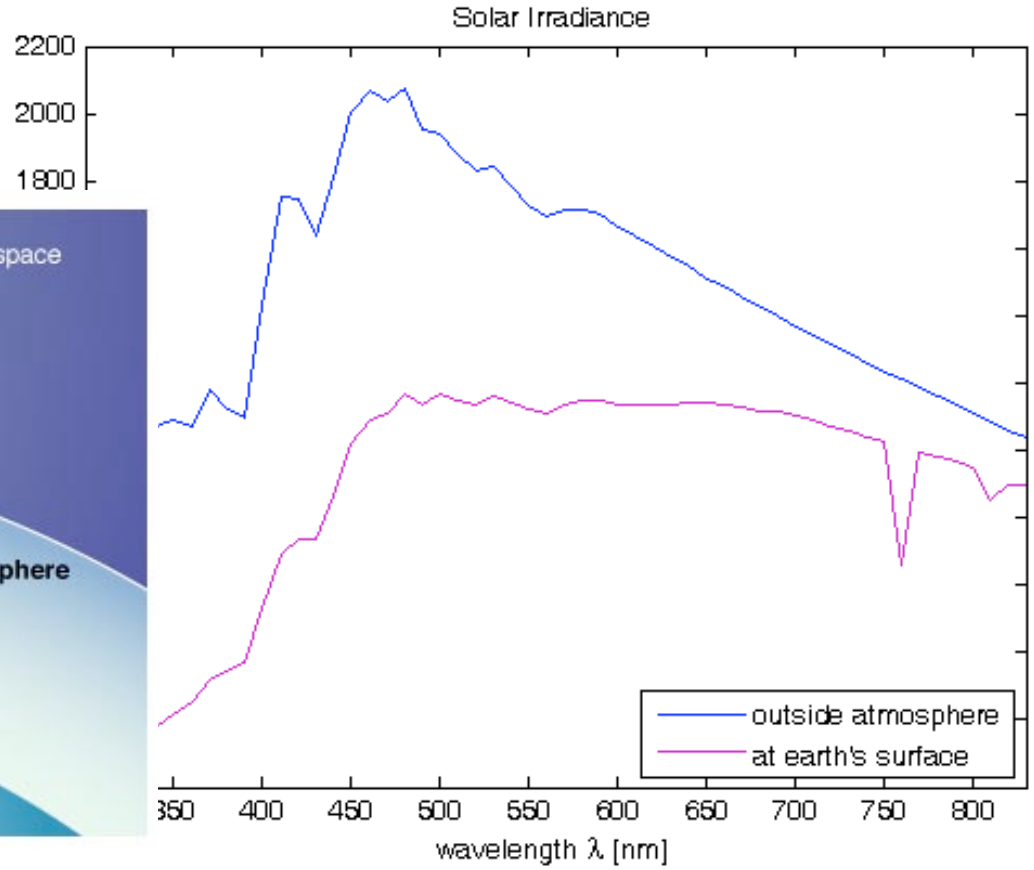
Background and basic idea:

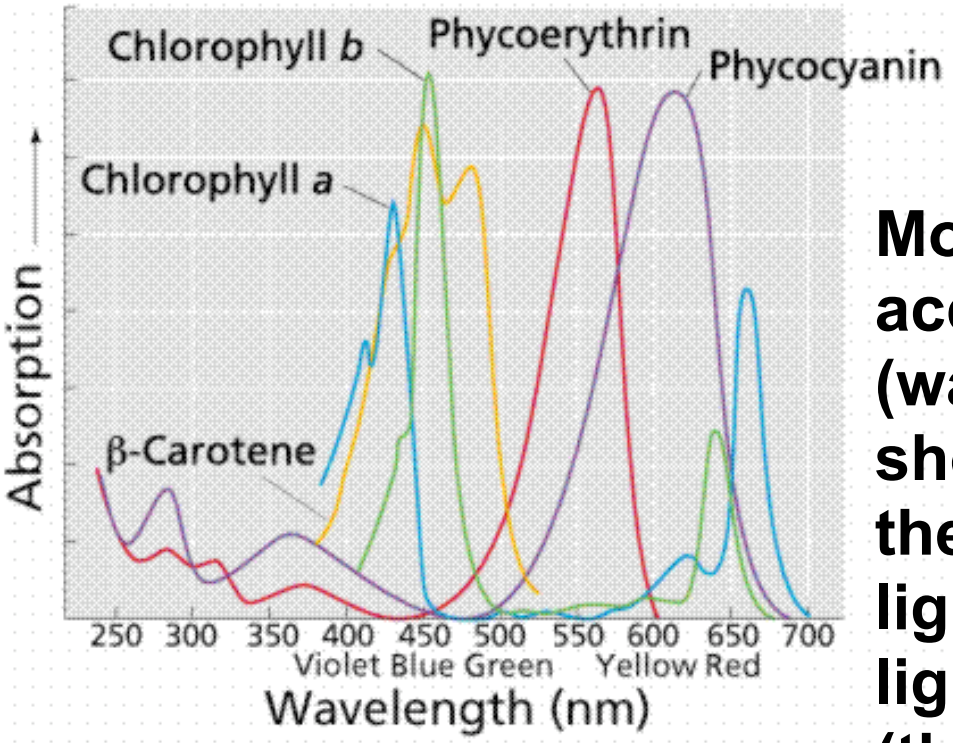
The amount of energy received by the Earth from the Sun drives climate (atmosphere, oceans, and polar caps) and it governs biological activity such as photosynthesis.



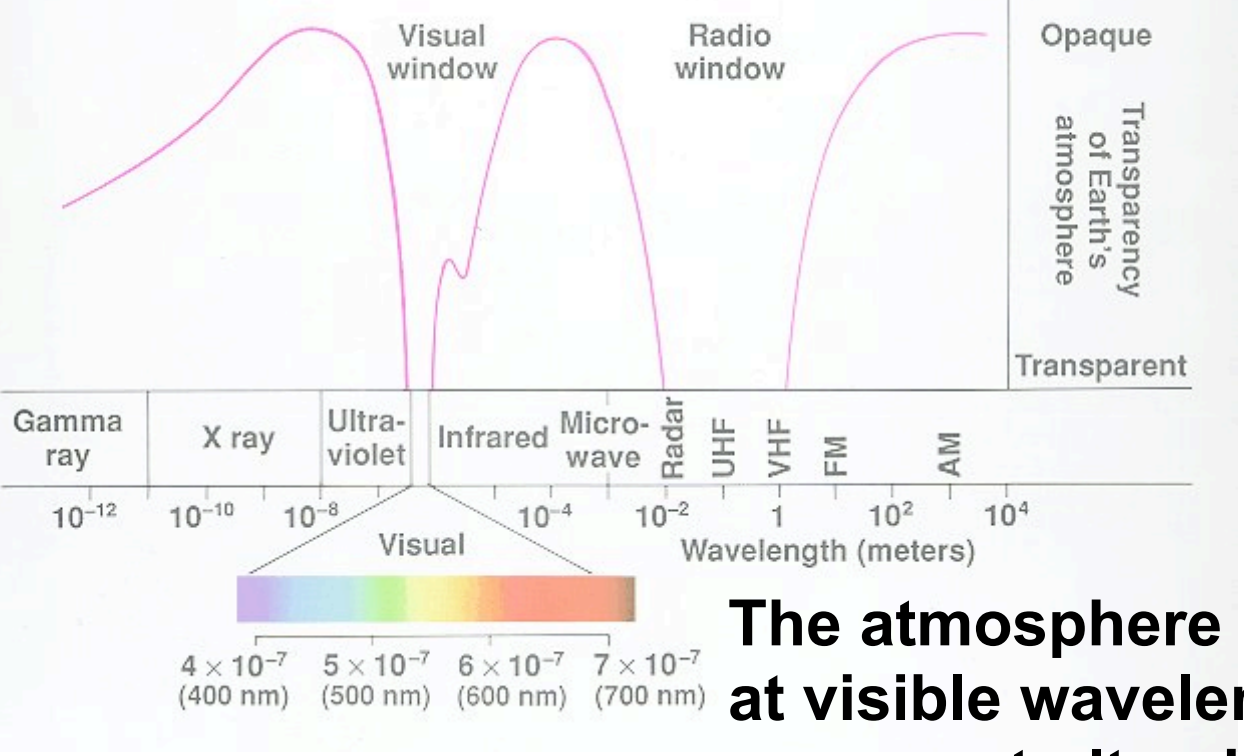
The amount of sunlight that reaches the *surface* of the Earth can be measured. This is connected to the Sun's energy, minus whatever energy may have been reflected or absorbed by the atmosphere.





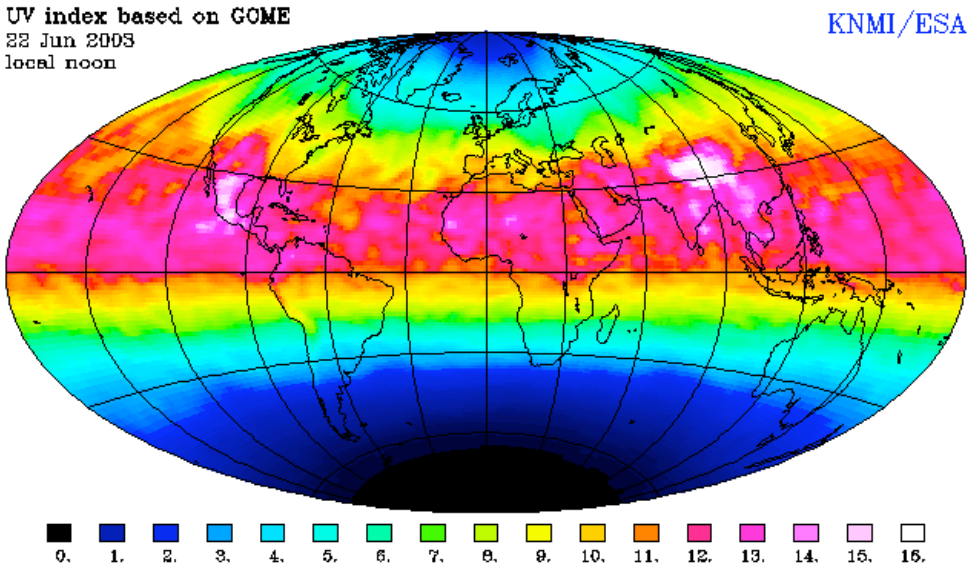


Molecules can absorb light according the the energy (wavelength) of the light. The shorter the wavelength (bluer), the higher the energy of the light. In this way, the color of light matters for photosynthesis (think: grow lights). We can also measure the color of sunlight, in addition to its intensity.



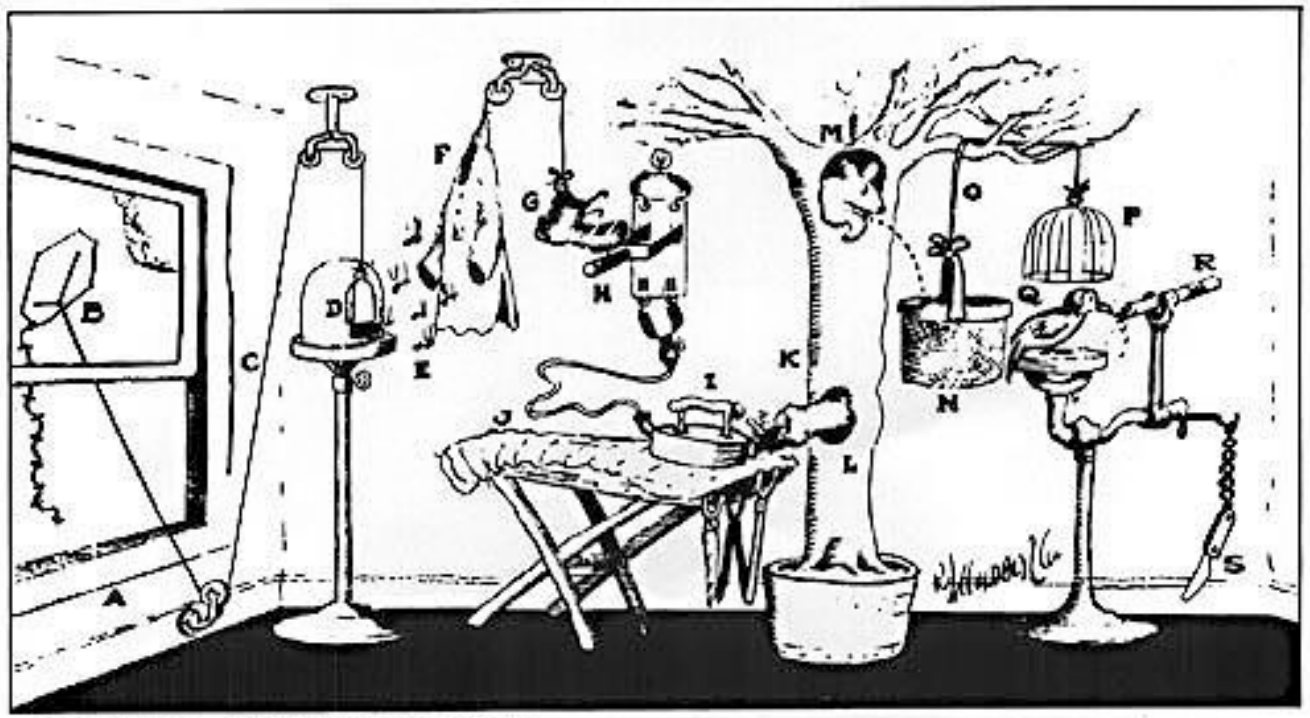
The atmosphere is mostly transparent at visible wavelengths and mostly opaque at ultraviolet and infrared wavelengths. By measuring the intensity of sunlight at wavelengths that are *partly* transparent, we may expect to see variations in the transparency depending on the state of the atmosphere, and thus relate one to the other.

For example, the "UV Index" is a forecast of the intensity of ultraviolet radiation that depends on the amount of ozone in the upper atmosphere, cloud cover, altitude above sea level, latitude, and other factors. The higher the UV index for a given day, the greater the chance for sunburn.



We can make a measurement of the actual intensity of ultraviolet radiation on a given day, and compare it to the forecast as a check. (As you may have presumed, the Sun is by far the strongest natural source of ultraviolet light.)

To do all this, we need to build an instrument that can measure light (a photocell), and a gadget that sends only certain wavelengths to the photocell (so that we can tune to just the ultraviolet light, and filter out all the other light). All of the parts to this instrument can be obtained easily, and our task will be to assemble a working prototype that can be refined by your students.



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