



Solar Energy Concepts Review

Solar Electricity & Solar Thermodynamics

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The Rahus Institute***



Solar Energy Concepts



1. Solar Orientation

2. Electrical Concepts

3. Thermodynamic Concepts

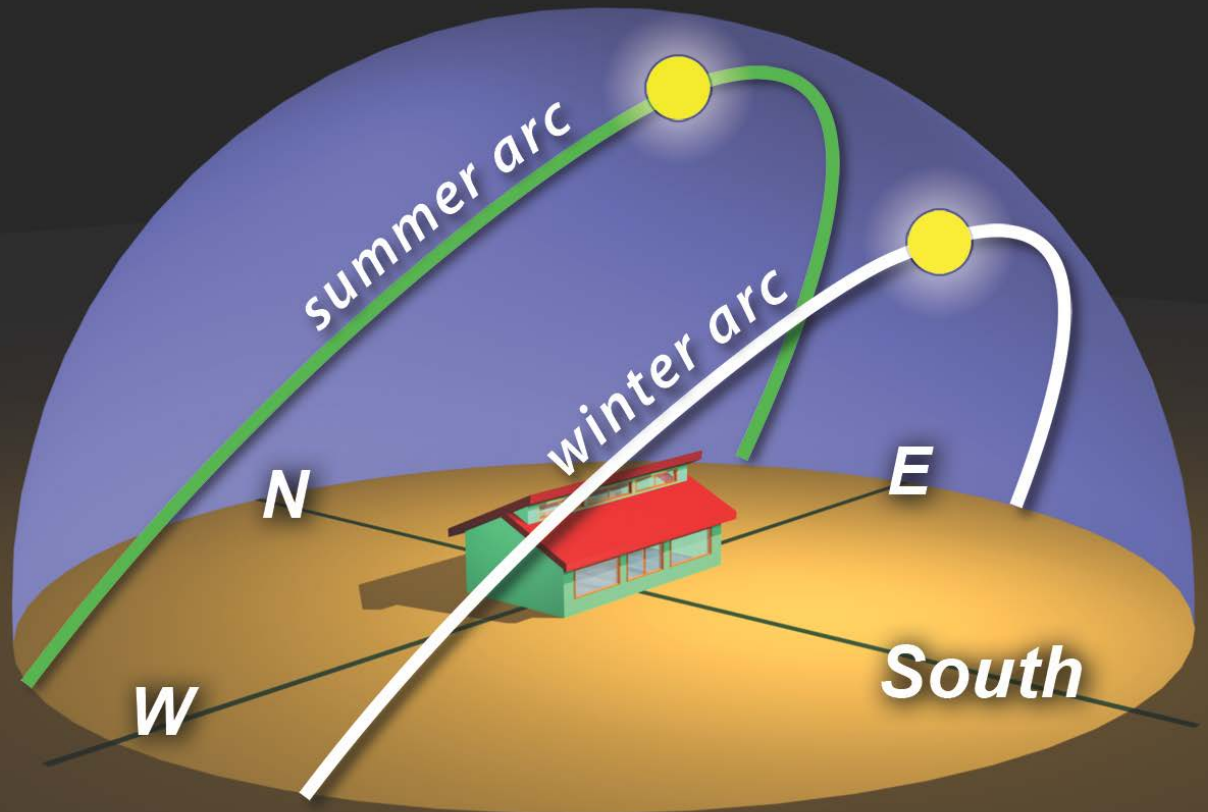
4. Passive Solar Design

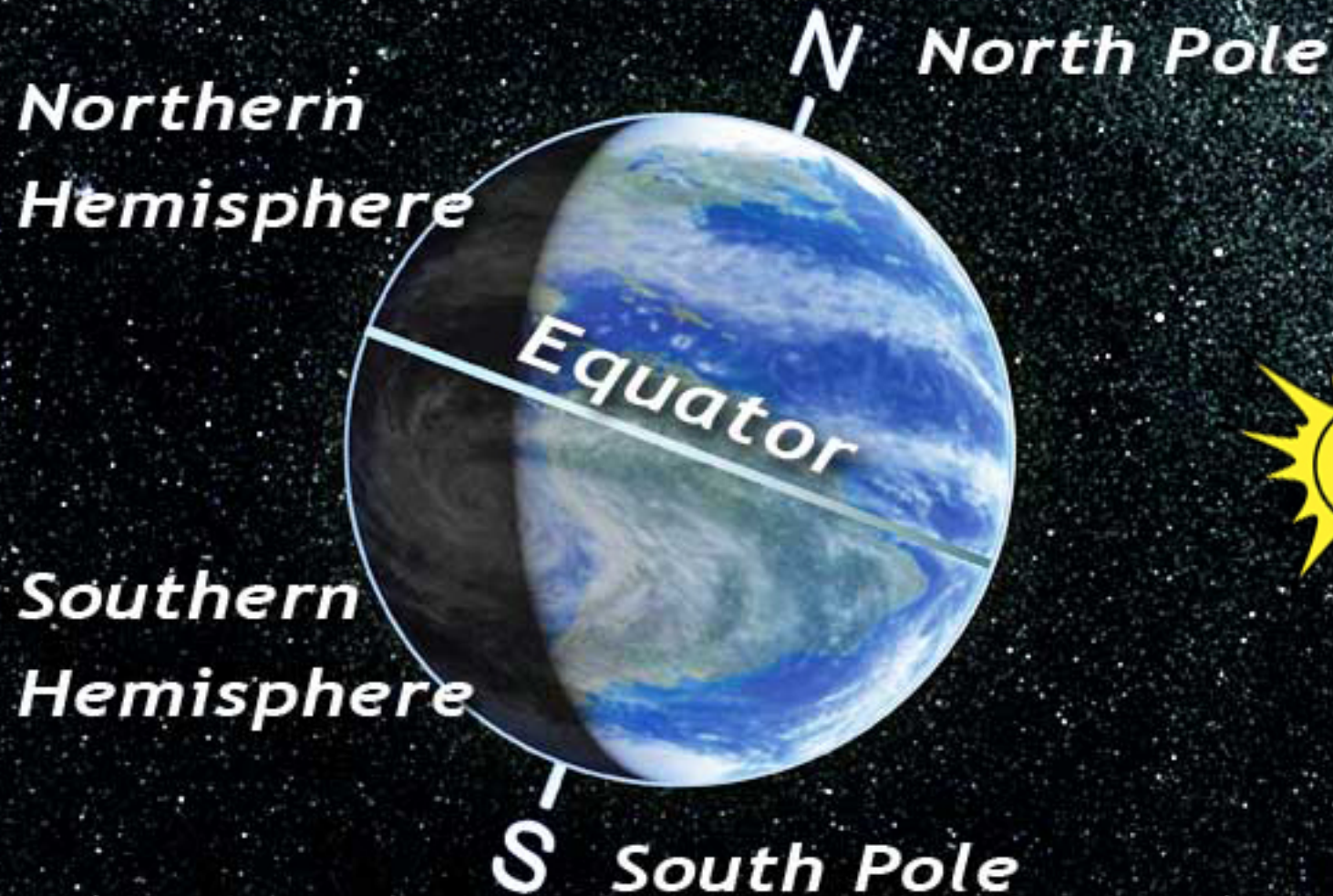


Solar Orientation & Site Analysis

***Seasonal
Sun
Paths***

WHY?

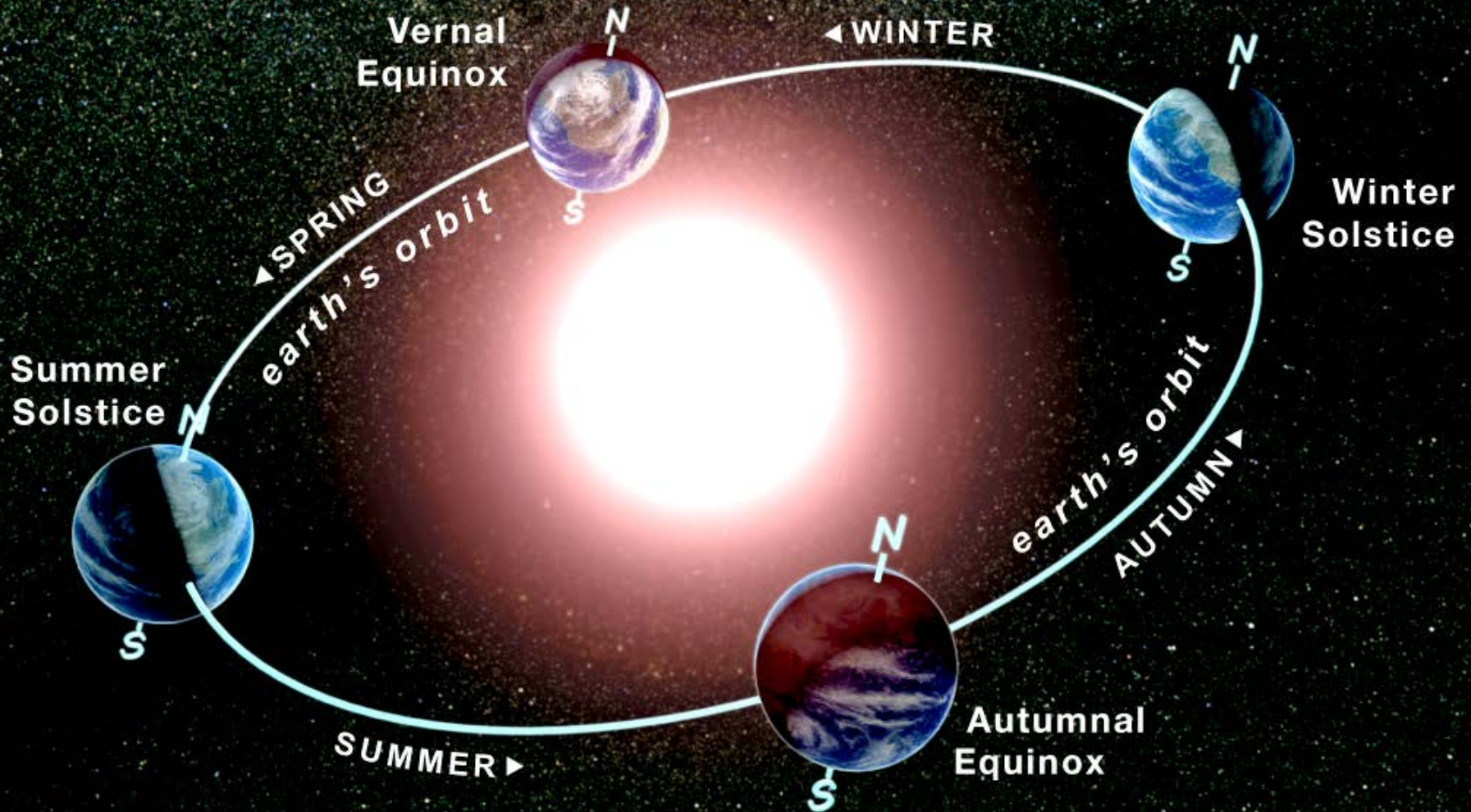




23.5 degree tilt



Earth's Tilt & the Seasons



***This makes it hotter in
the summer - WHY?***



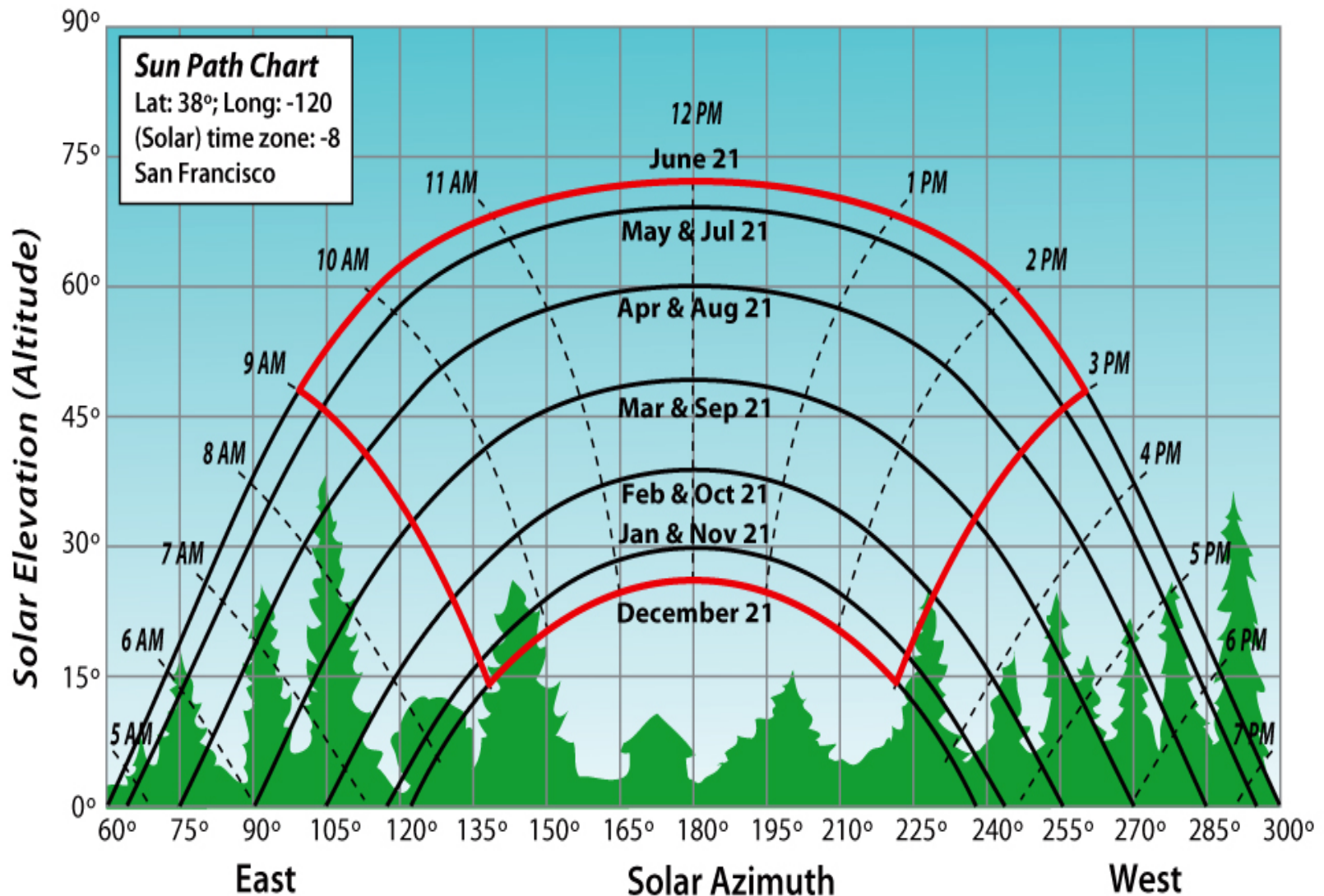
Why is it hotter in the summer?



- 1. Sun is higher in the sky***
- 2. Sunlight is more intense.***
- 3. Days are longer.***

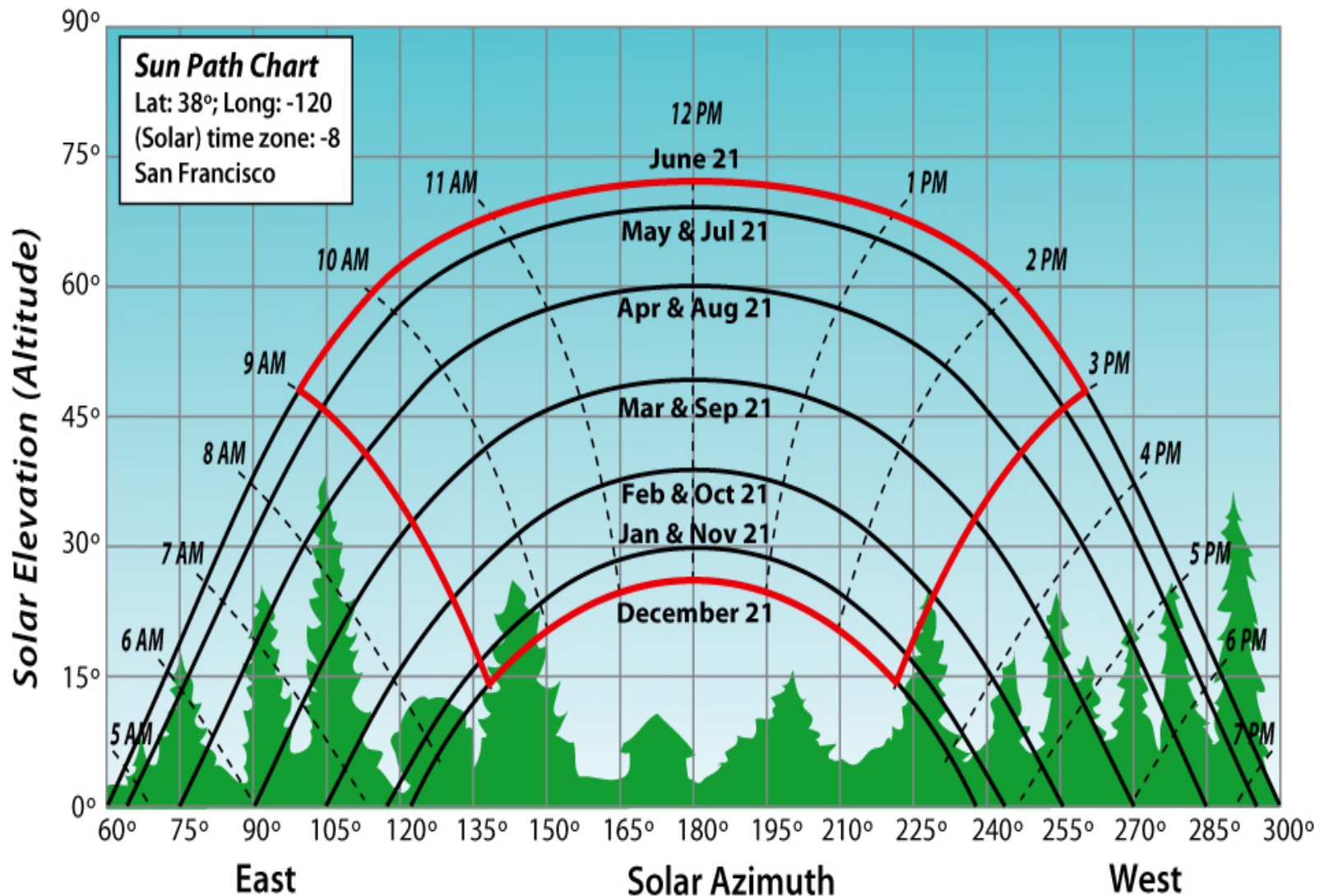


What is the RED OUTLINE?





SOLAR WINDOW



To use a sun path chart:

***What's the first thing
you need to know?***

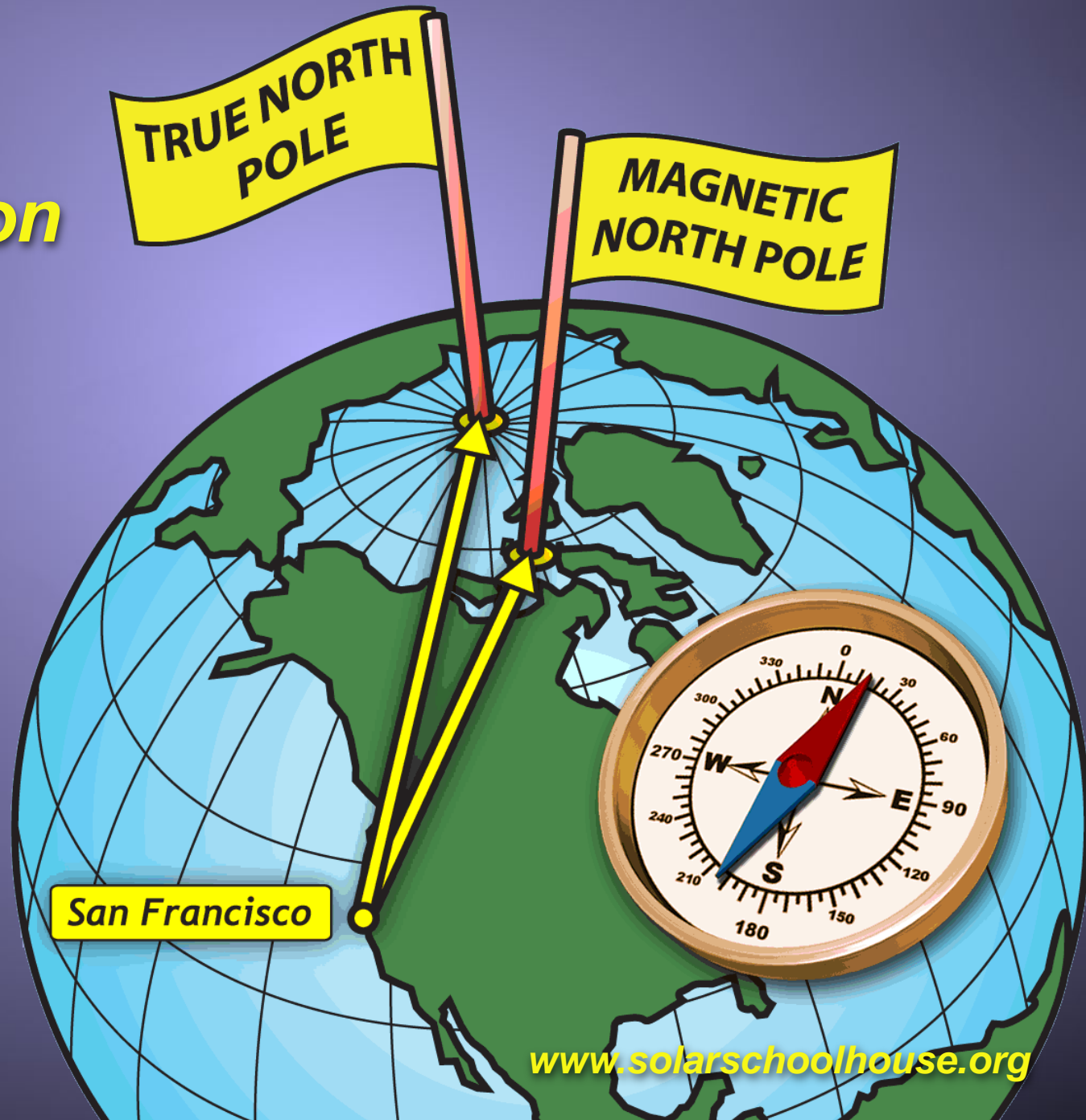


To use a sun path chart:

TRUE SOUTH



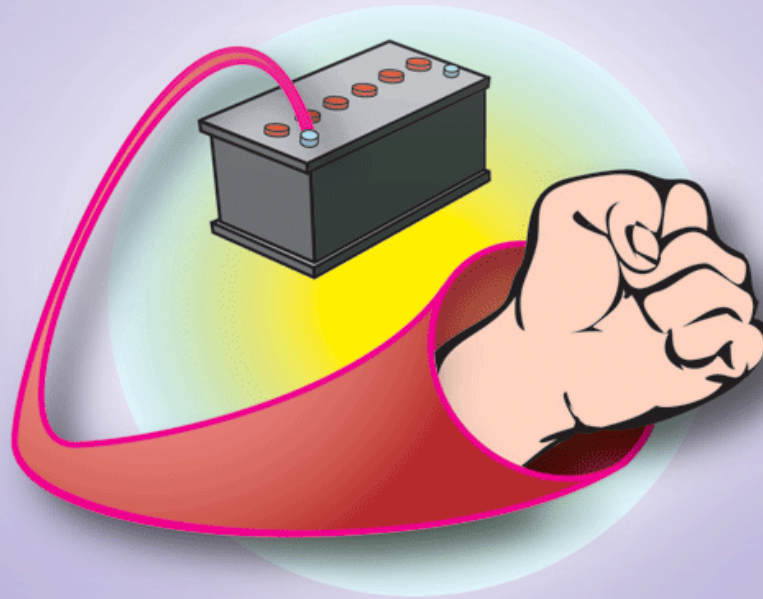
Magnetic Declination





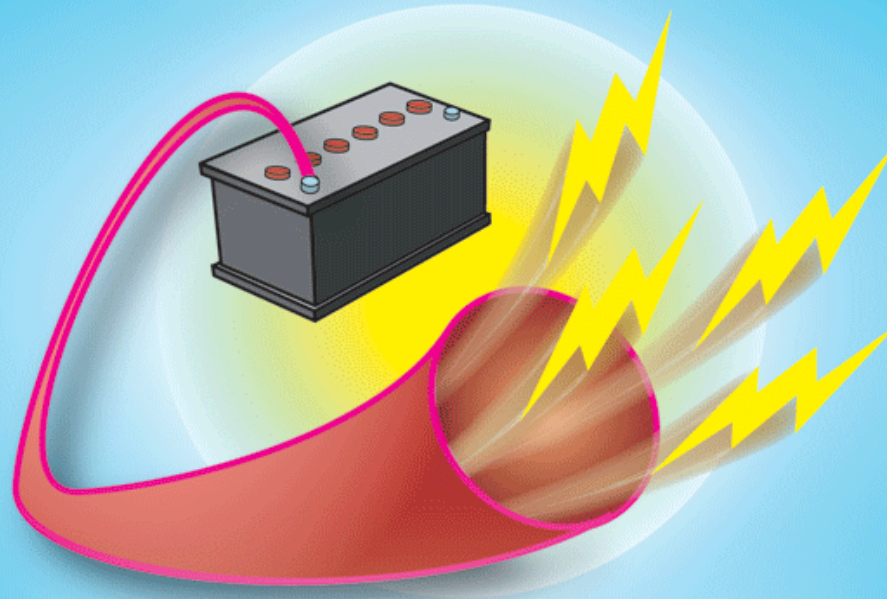
Electrical Concepts

VOLT **(FORCE)**



**MEASURES ELECTRICAL
PRESSURE**

AMPERE (CURRENT)



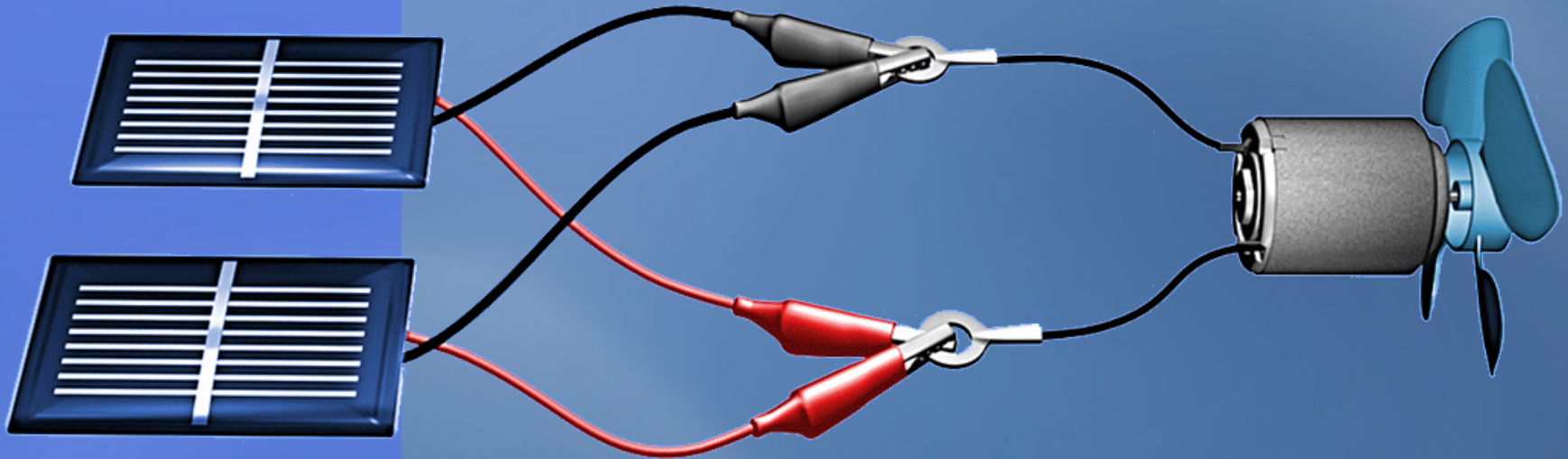
**MEASURES THE NUMBER
OF MOVING ELECTRONS
(OR ELECTRIC CHARGES)**

WATT (POWER)



**MEASURES HOW FAST
ELECTRICITY IS USED
(OR GENERATED)**

Solar Cell Circuits



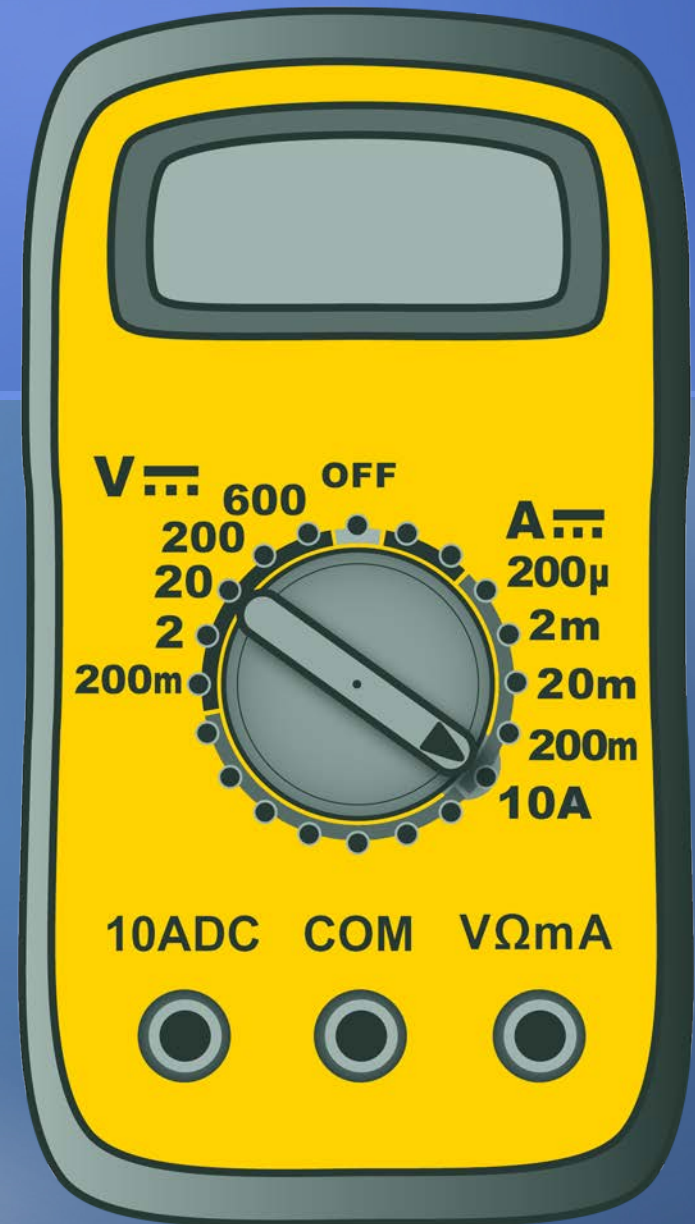
What kind of wiring is this?



Digital Multimeter

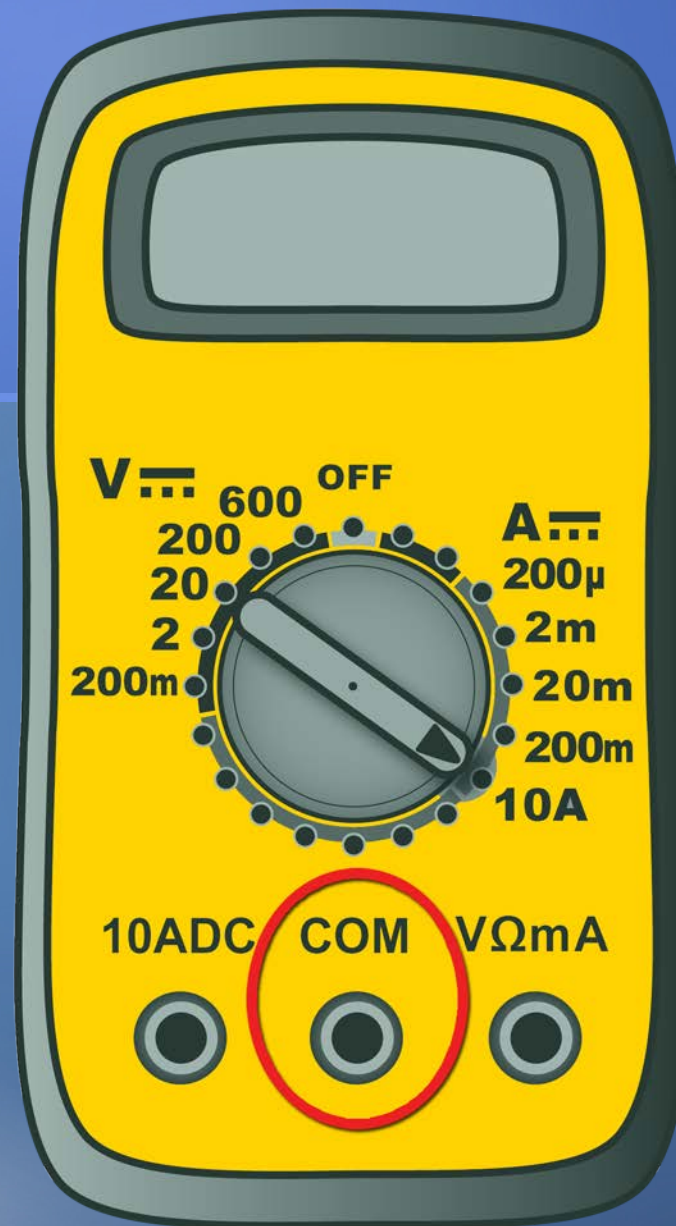


***Which PORT
is the
NEGATIVE
lead ALWAYS
connected to?***





***The
NEGATIVE
lead is
ALWAYS
In the
COM port
blaCk = Com***





SAV PAA!!





S.A.V.



Series Adds Volts



P.A.A.



Parallel Adds Amps



WATT-HOUR



WATT-HOUR





**Watts is a RATE of energy use
(like Miles Per Hour)**

**Watt-Hours is an
AMOUNT of energy used
(like miles traveled)**



*If this heater uses
1,000 watts...*



...and it runs for 1 hour

*How much electrical energy
will it convert?*



*If this heater uses
1,000 watts...*



...and it runs for 1 hour

*It will use 1,000 watt-hours
Or 1 kilowatt-hour*





Thermodynamic Concepts



Heat Transfer Mechanisms?

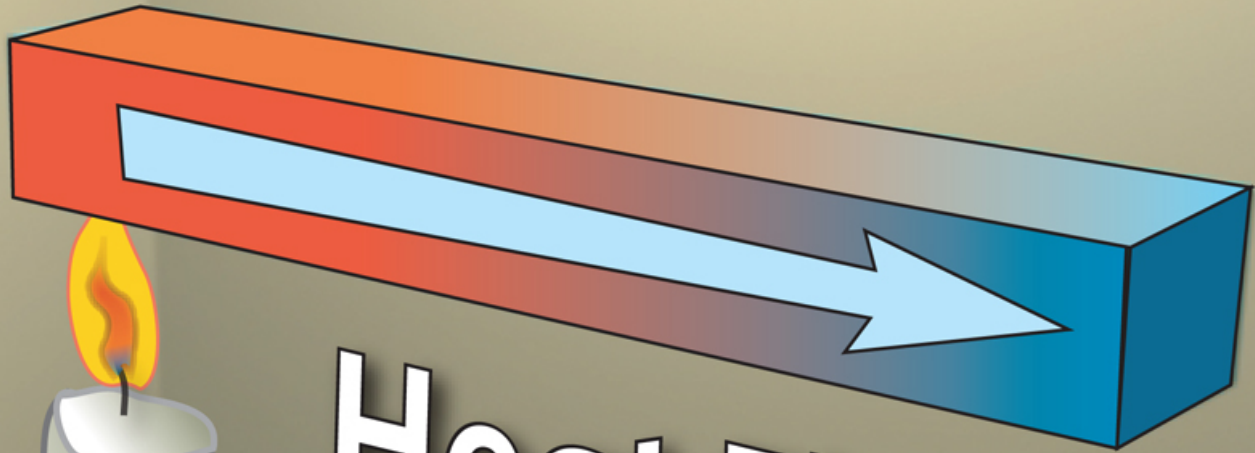
Heat Transfer Mechanisms



- 1. Conduction**
- 2. Convection**
- 3. Radiation**



Conduction

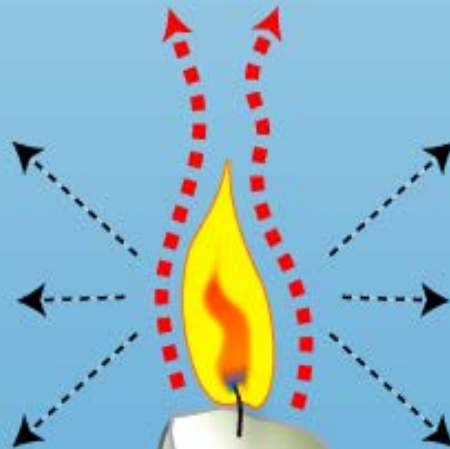


Heat Flow

Through Solids



Convection



Heat Flow in Fluids



Convection Cooling



Radiation



*Heat Transfer
by*

*ELECTROMAGNETIC
WAVES*

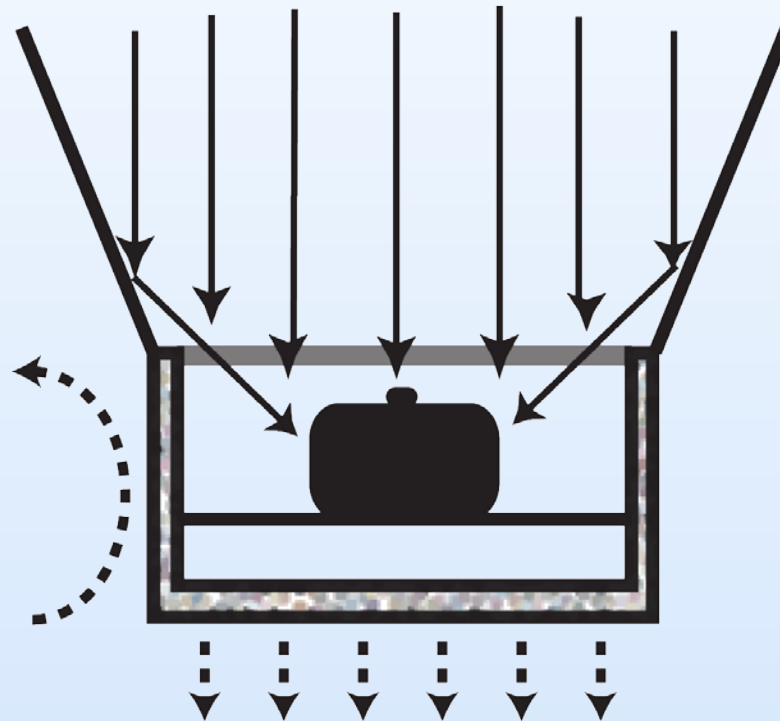


Sun Oven



*Heat Gain
by Solar
Radiation*

*Convective
Heat Loss*



*Insulation
Slows
Heat Loss*

Heat Loss By Conduction

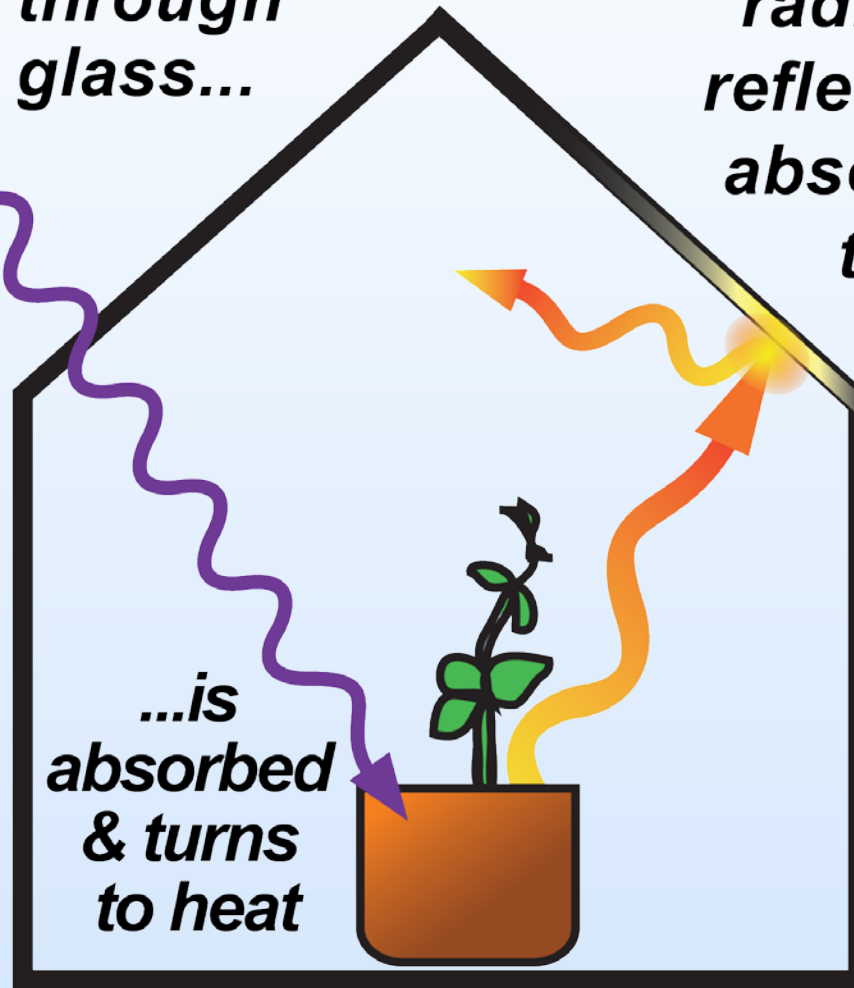


Greenhouse



***Sunlight
passes
through
glass...***

***Heat (infrared
radiation) is
reflected and
absorbed by
the glass***



***...is
absorbed
& turns
to heat***

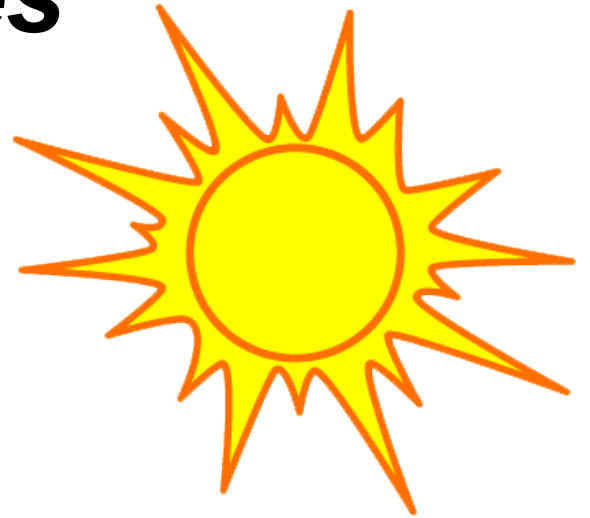




Solar Design Principles



Solar Design Principles



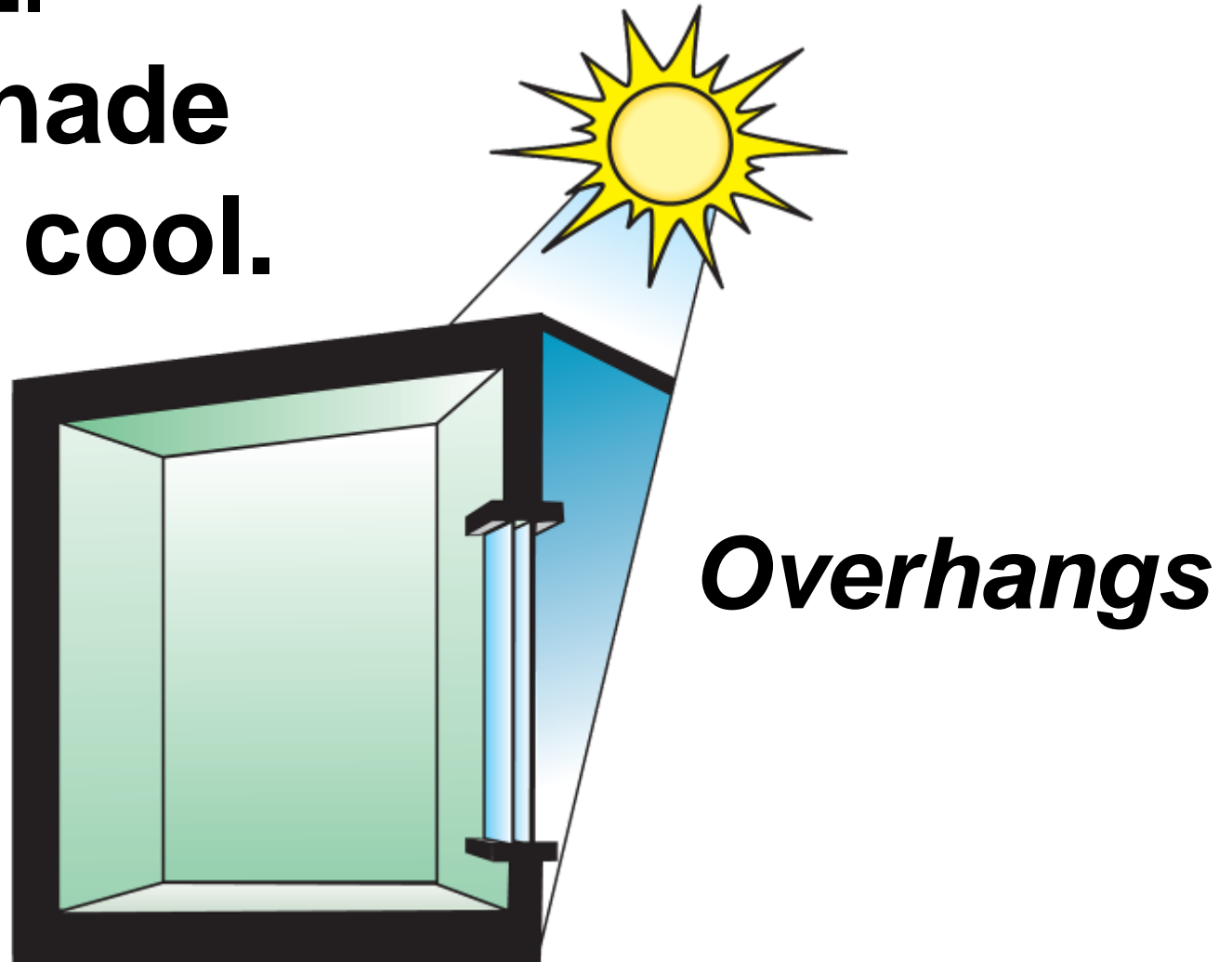
1.

Use sunlight for warmth.

Solar Design Principles

2.

**Use shade
to stay cool.**



Solar Design Principles



3. Use thermal mass to store warmth & “coolth.”

Solar Design Principles

4.
Use insulation
to keep heat
in or out.



Solar Design Principles

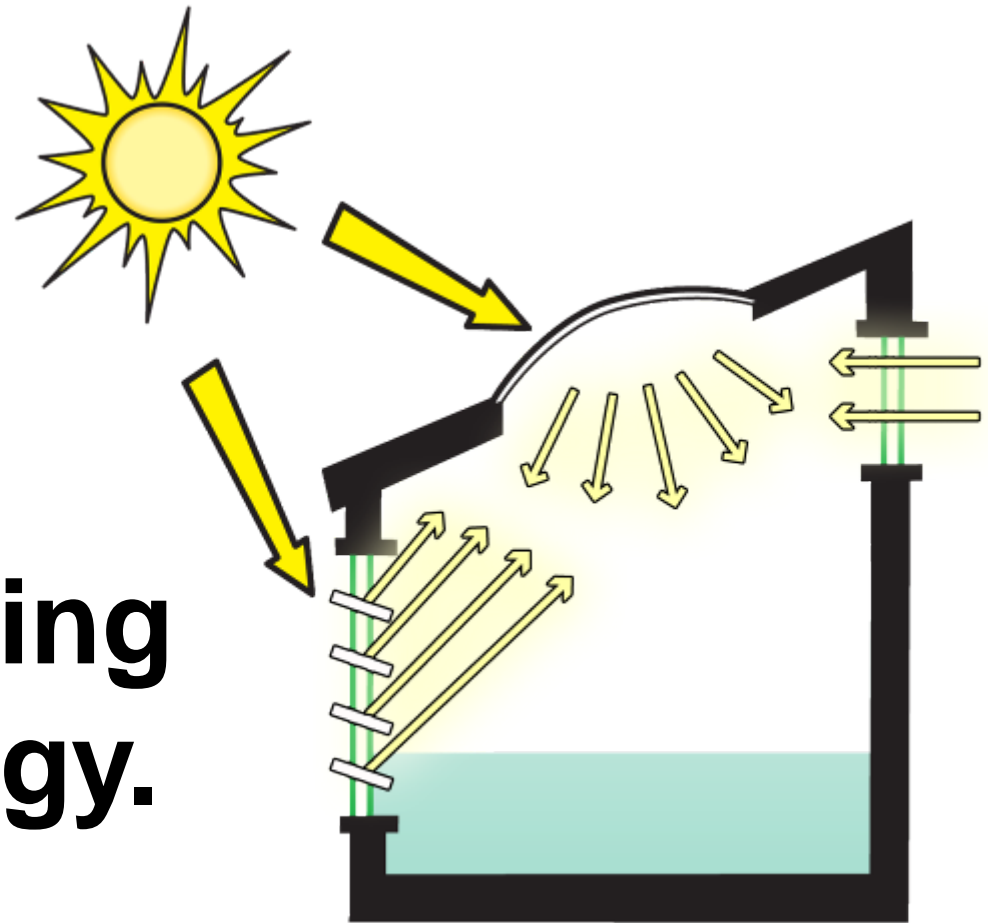
5.
Use air
to move
heat
&
coolness.



Solar Design Principles

6.

**Use daylighting
to save energy.**





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Rahus Institute***

***Thank you from the
Solar Schoolhouse!***