


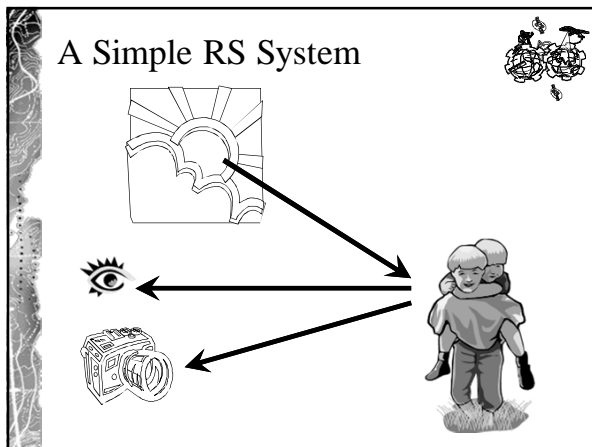
Remote Sensing
Topic 1: Fundamentals of Remote Sensing

Chapter 1: Lillesand and Keifer



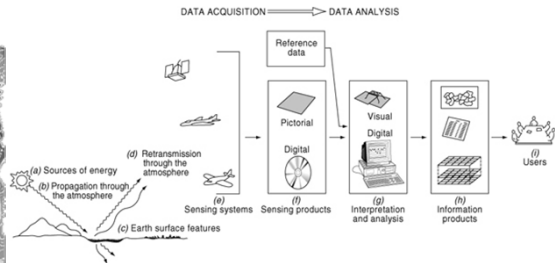
Remote Sensing:

Def'n.
The art, science, and technology associated with the _____ about an object, area, or phenomenon _____.



A Simple RS System

Elements of a Complete Remote Sensing System

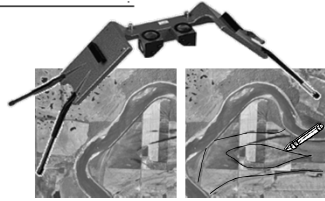


Airphoto Interpretation



Def'n
Analysis of _____
to extract _____ and _____ information.

Includes _____ ?



Photogrammetry



Def'n
Extraction of _____ information

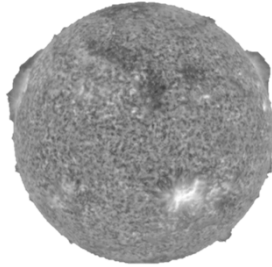
Type of photos? _____

Includes measures of:

1. _____
2. _____
3. _____
4. _____



Electromagnetic Energy

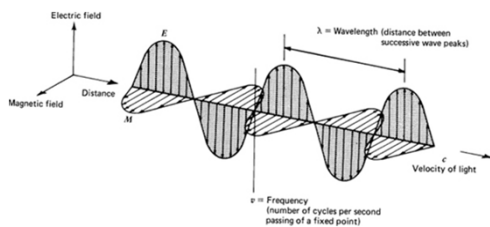


EMR



- Modern physics acknowledges dual nature of EMR
- The wave-particle duality refers to how EMR of differing wavelengths behaves, not what it is
- Low frequency EMR tends to act more like a wave; higher frequency EMR act more like a particle
- Photo/electro-optical remote sensing systems can be adequately described using the wave model

Wave Model



Particle Model



- EMR is comprised of tiny particles (quanta) called photons travelling in a wave-like pattern at c
- Total amount of energy:

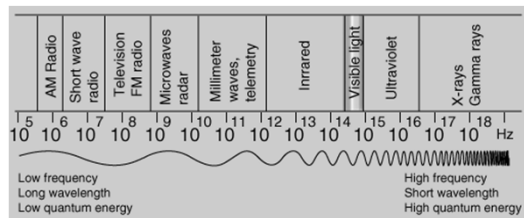
$$Q = h \nu$$

where : Q = energy of a quantum
 h = Planck's constant

or

$$Q = h c / \lambda$$

EMR



So What?

Radiance of EMR



- Black bodies ?
- Stephan-Boltzman equation describes total radiation emitted by a black body as a function of temperature:

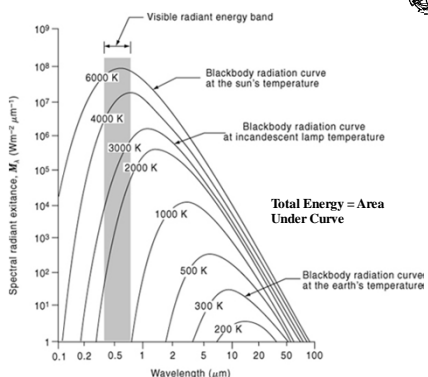
$$M = \sigma T^4$$

where: M = energy (Wm^{-2})

σ = Stephan-Boltzman constant

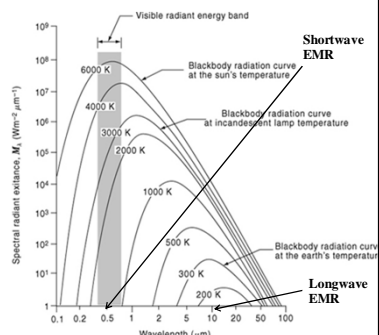
T = temperature (K)

Total EMR Emitted



Wavelength of EMR Emitted

Wein's Law states that $\lambda_m = A/T$ where A is a constant

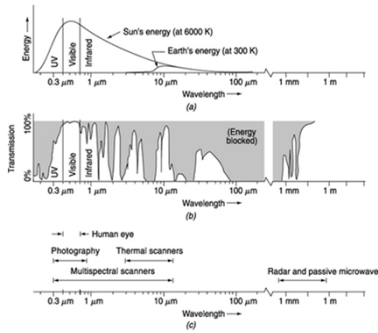


Atmospheric EMR Interactions

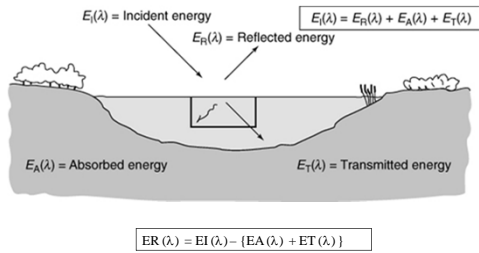
- 1
- 2
- 3



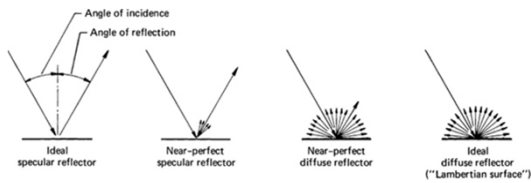
Where Do We Look ?



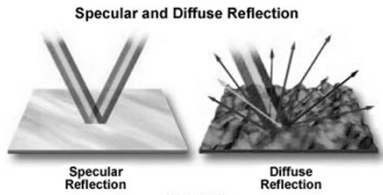
What Happens to Incident EMR



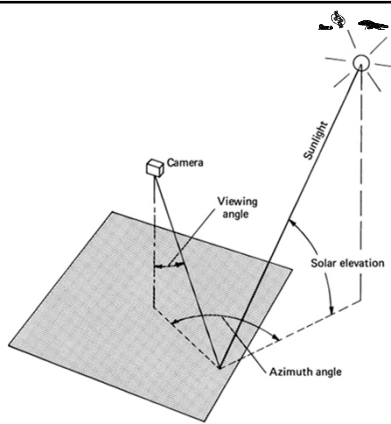
Types of Reflection



Specular vs. Diffuse Reflection

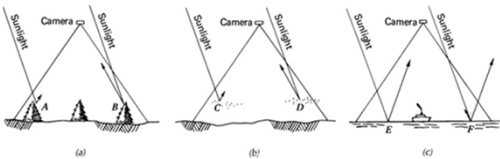


Geometric Influences

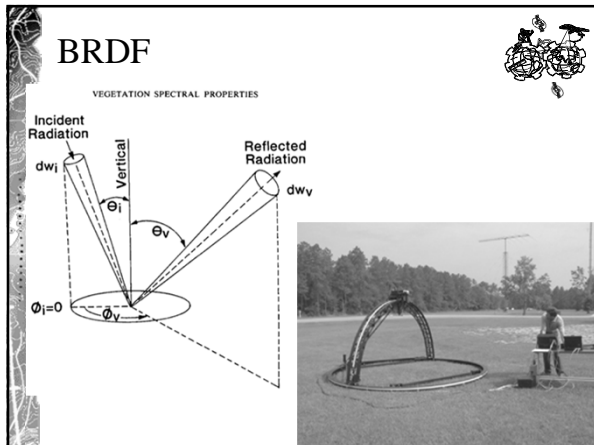


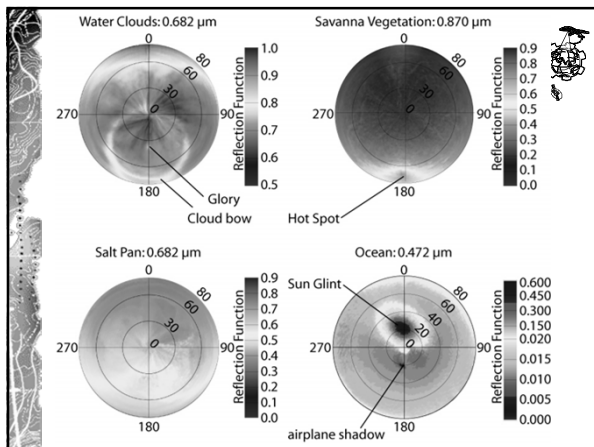
Geometric Effects

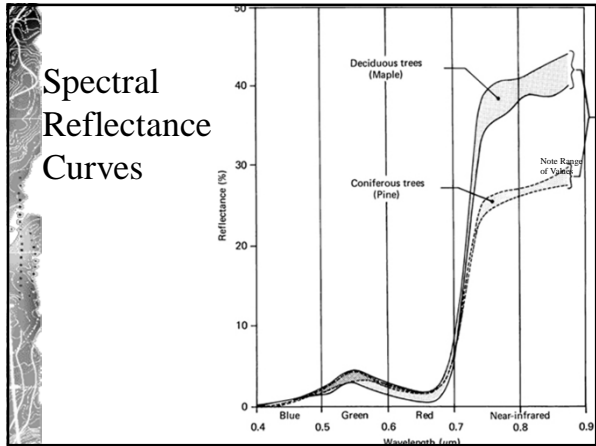
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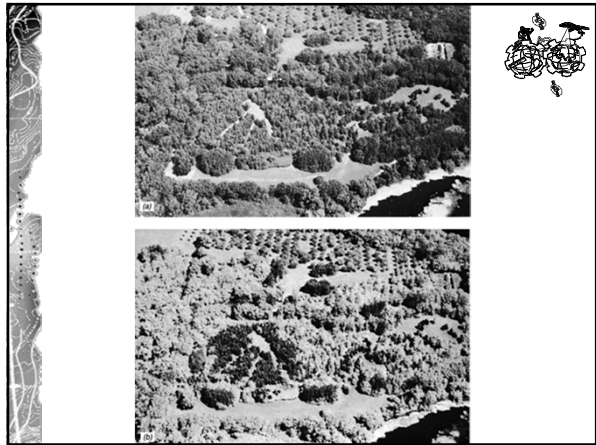


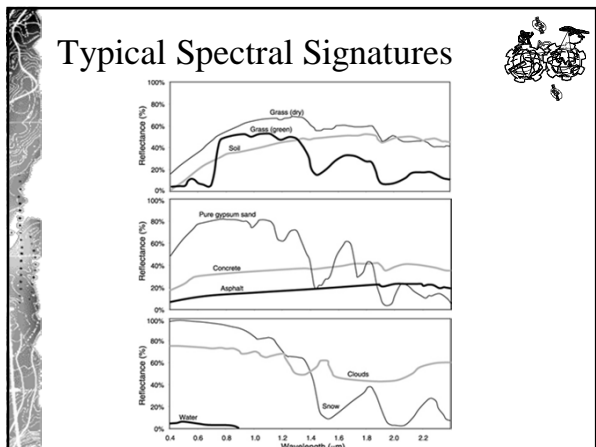












The Foundation of RS



- * RS systems detect reflected or emitted EMR
- There are differences in how objects interact with and/or emit EMR that are λ dependent
- This results in unique spectral characteristics or signatures

* Exceptions are RS systems based on the detection of sound, gravity, and electrical resistivity.
