

Imagery Interpretation in the Google Earth Era



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Research Question

How has Google Earth changed imagery interpretation?



Introduction

- Imagery interpreter with six years experience
- Three years teaching imagery interpretation using Google Earth/Maps
 - Students are professionals in their field, but not with imagery
 - Eight iterations of week-long instruction since 2011
- Student feedback data

Definition

“[Imagery interpretation is] the examination of images for the purpose of identifying objects and judging their significance.”

(Philipson, 1997; McGlone, 2004)

A Brief History of Imagery Interpretation

A picture is worth a thousand words...

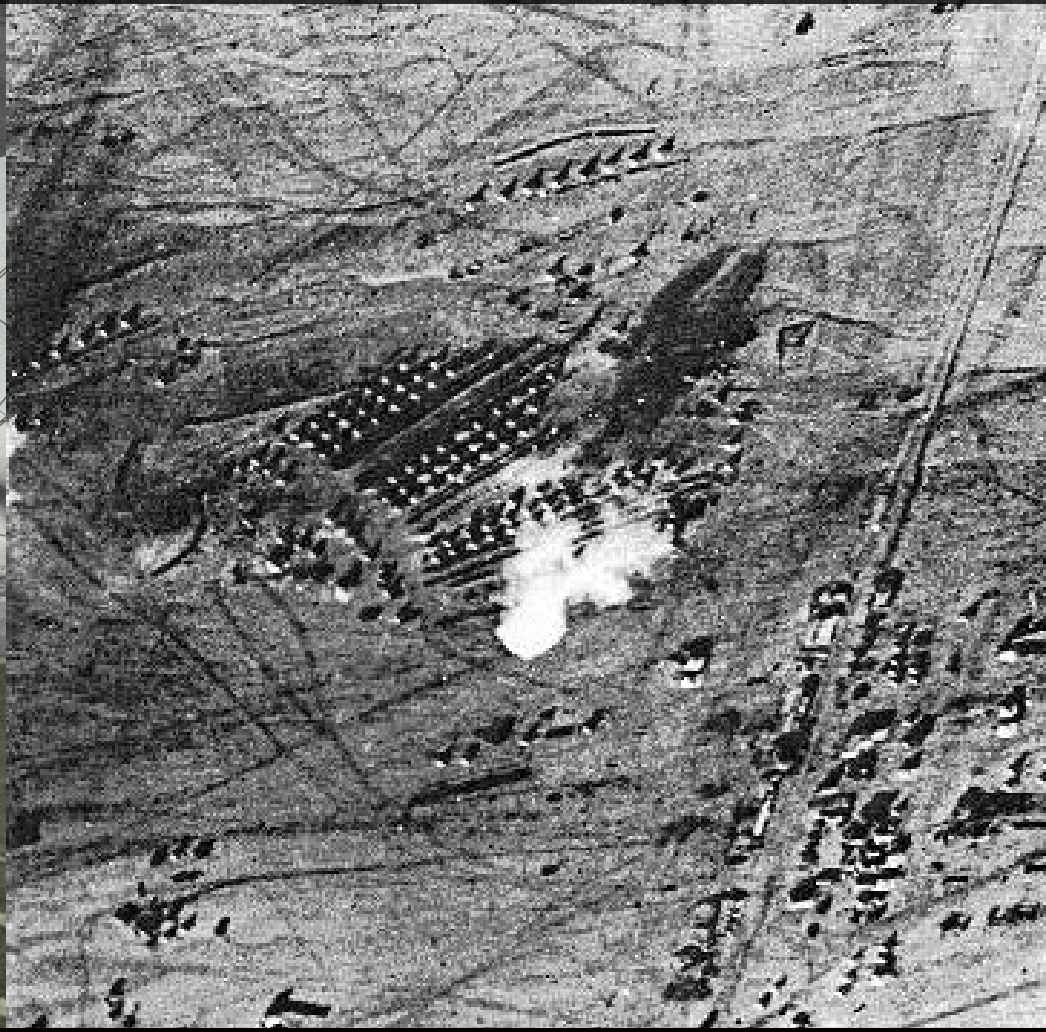


<http://www.papainternational.org/history.asp>

Summary of History

- Sensors and capabilities have driven imagery interpretation techniques
 - Air photo vs satellite
 - Spectral and temporal resolution
- The topic to be interpreted has largely influenced the subject matter expertise required
 - Early military needs
 - Civilian uses
 - Now less customized

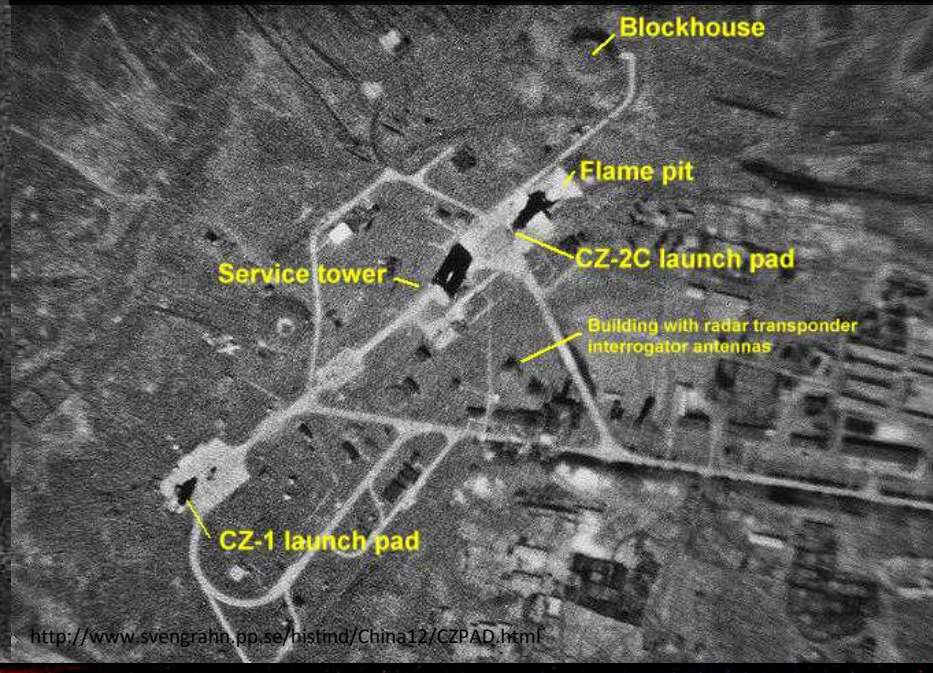
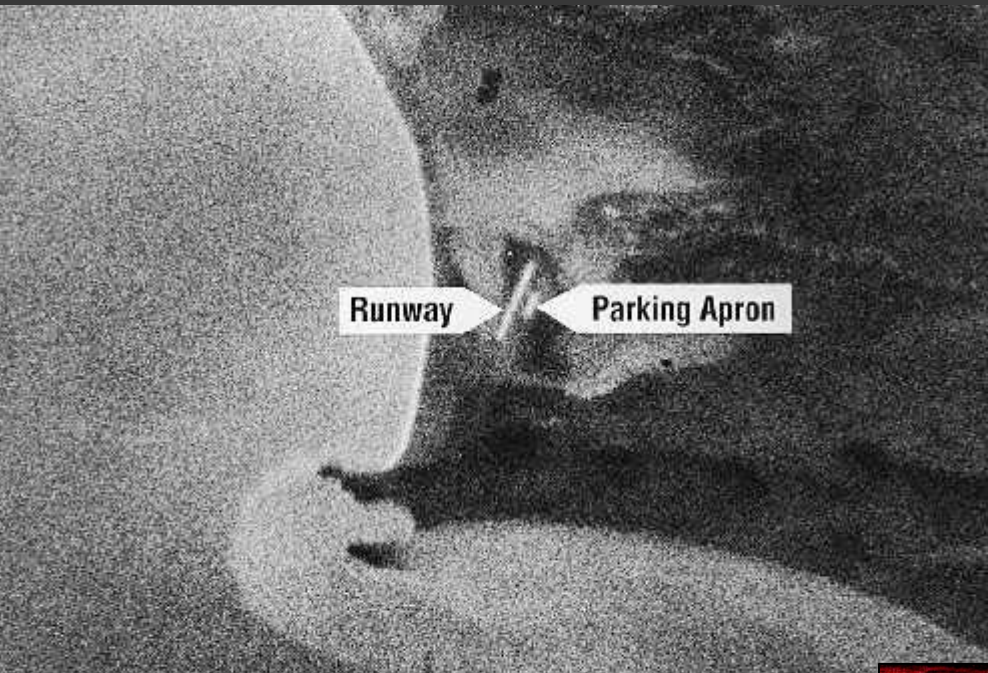
Early Aerial Platforms



“...in vertical photographs very few objects present an appearance that is natural in the light of our experience as lateral observers.”

-Lee (1922), *The Face of the Earth as Seen from the Air*

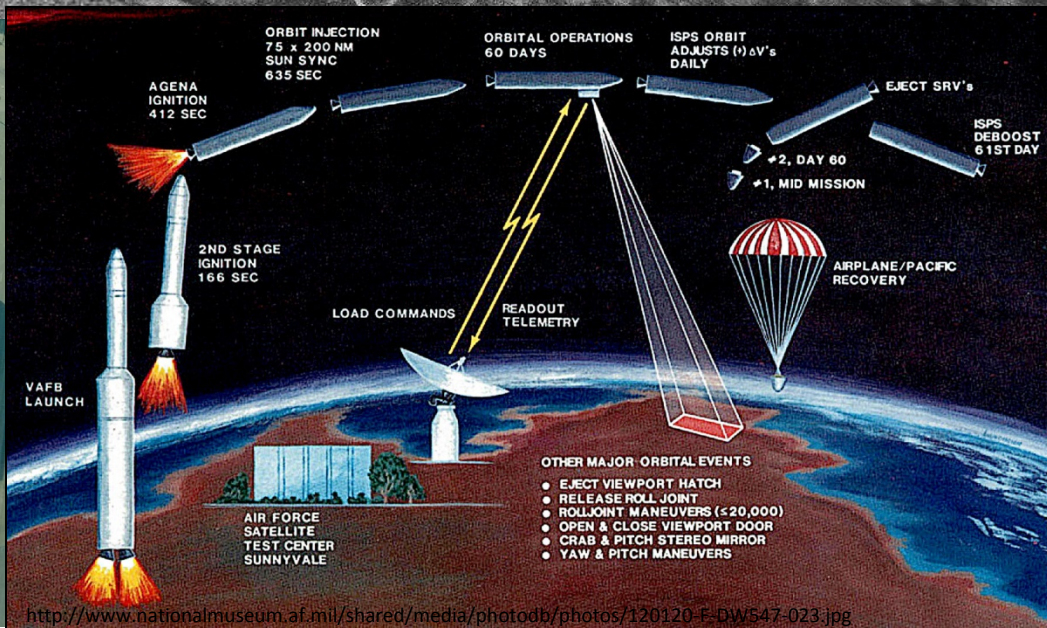
Into Space



<http://www.svengrahn.pp.se/histind/China12/CZPAD.html>

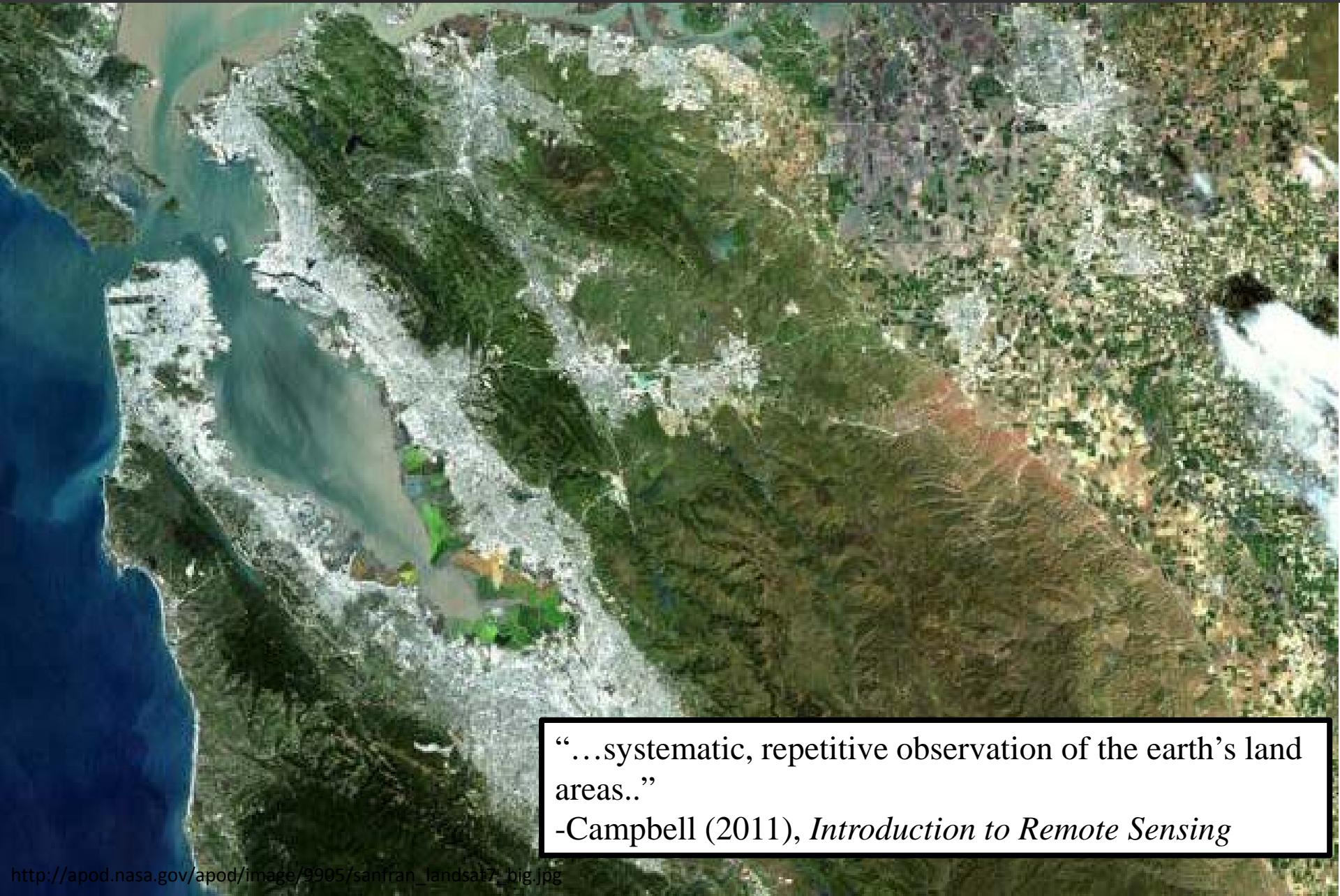


<http://cryptome.org/eyeball/nga-wny/pict43.jpg>



<http://www.nationalmuseum.af.mil/shared/media/photodb/photos/120120-F-DW547-023.jpg>

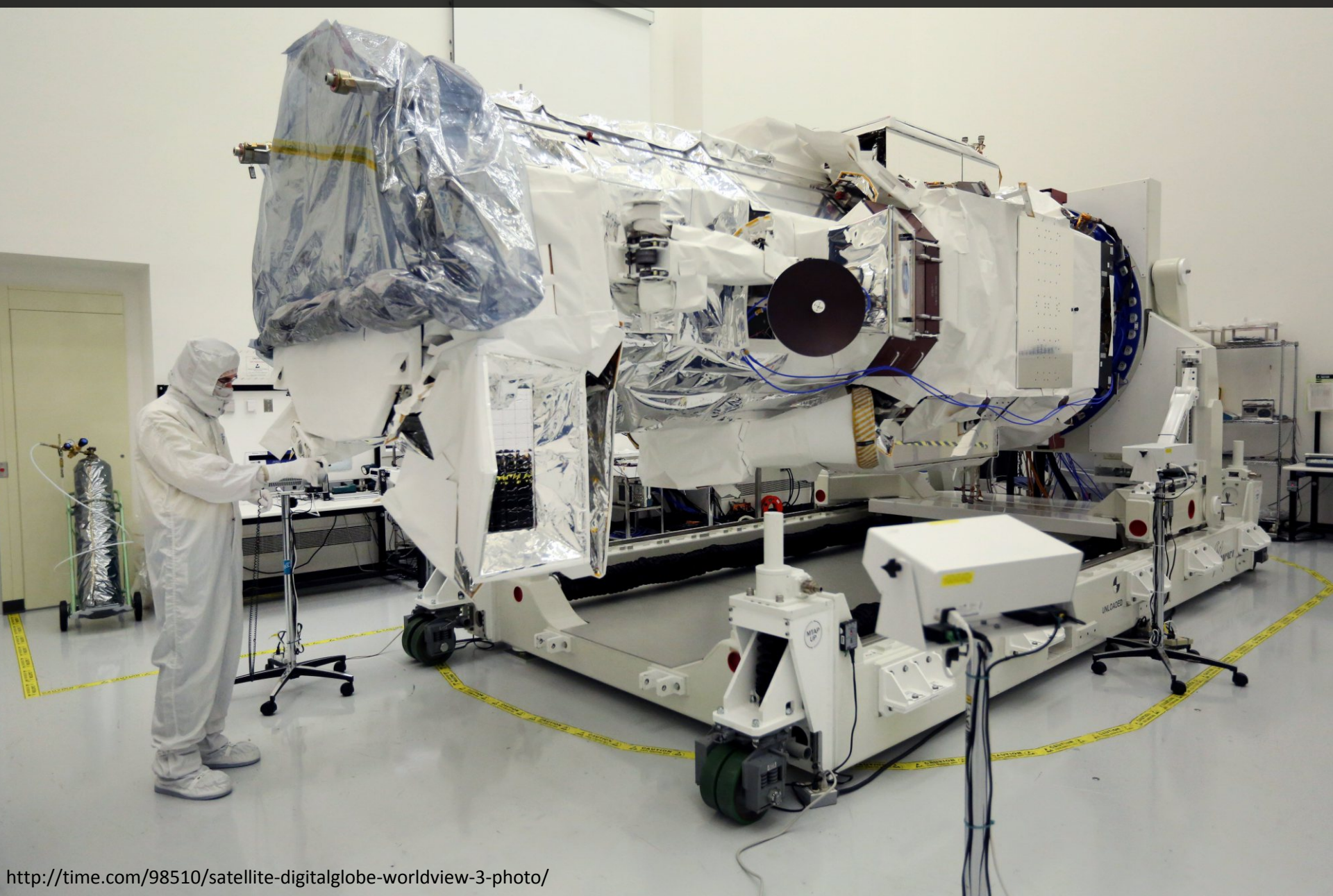
Landsat



“...systematic, repetitive observation of the earth’s land areas..”

-Campbell (2011), *Introduction to Remote Sensing*

Today's Commercial Satellite World



Going Small



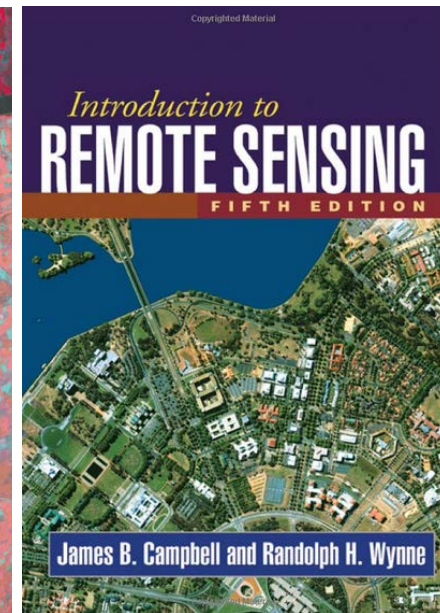
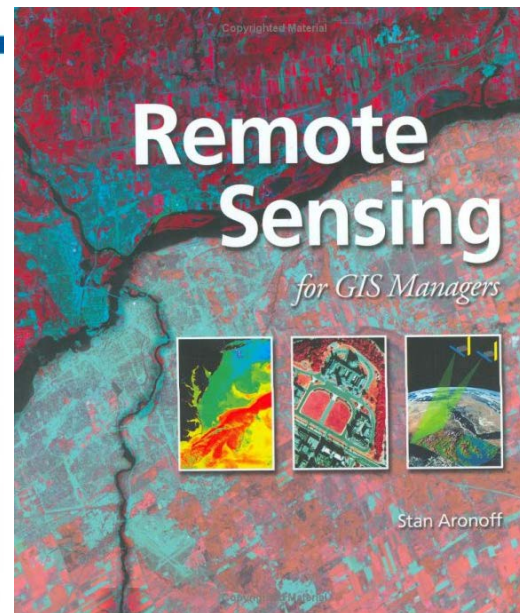
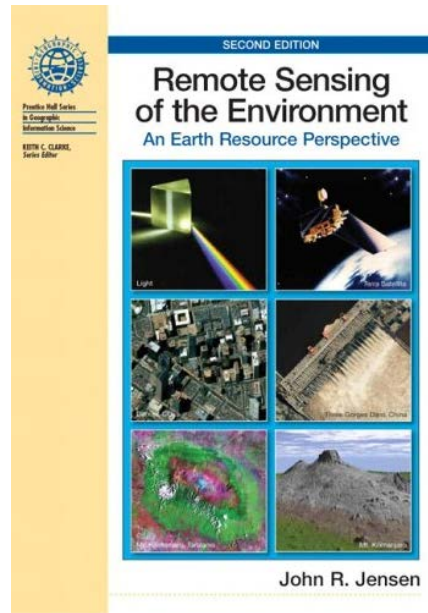
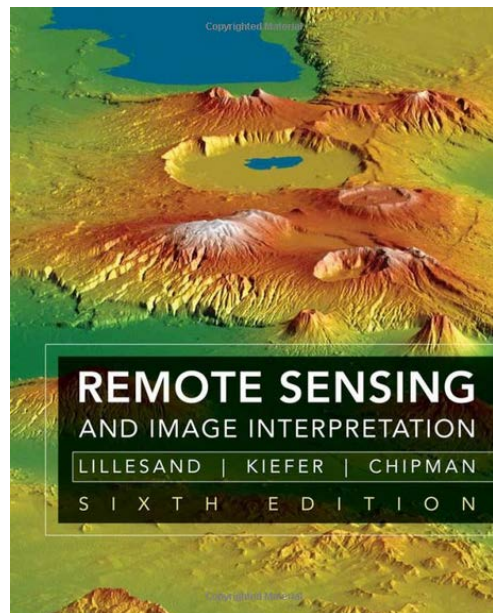
Goals of Project

- In the Google Earth era of imagery interpretation:
 - What elements of image interpretation, as classically taught, are less relevant?
 - What old concepts still hold true?
 - What are new capabilities?

Deliverables

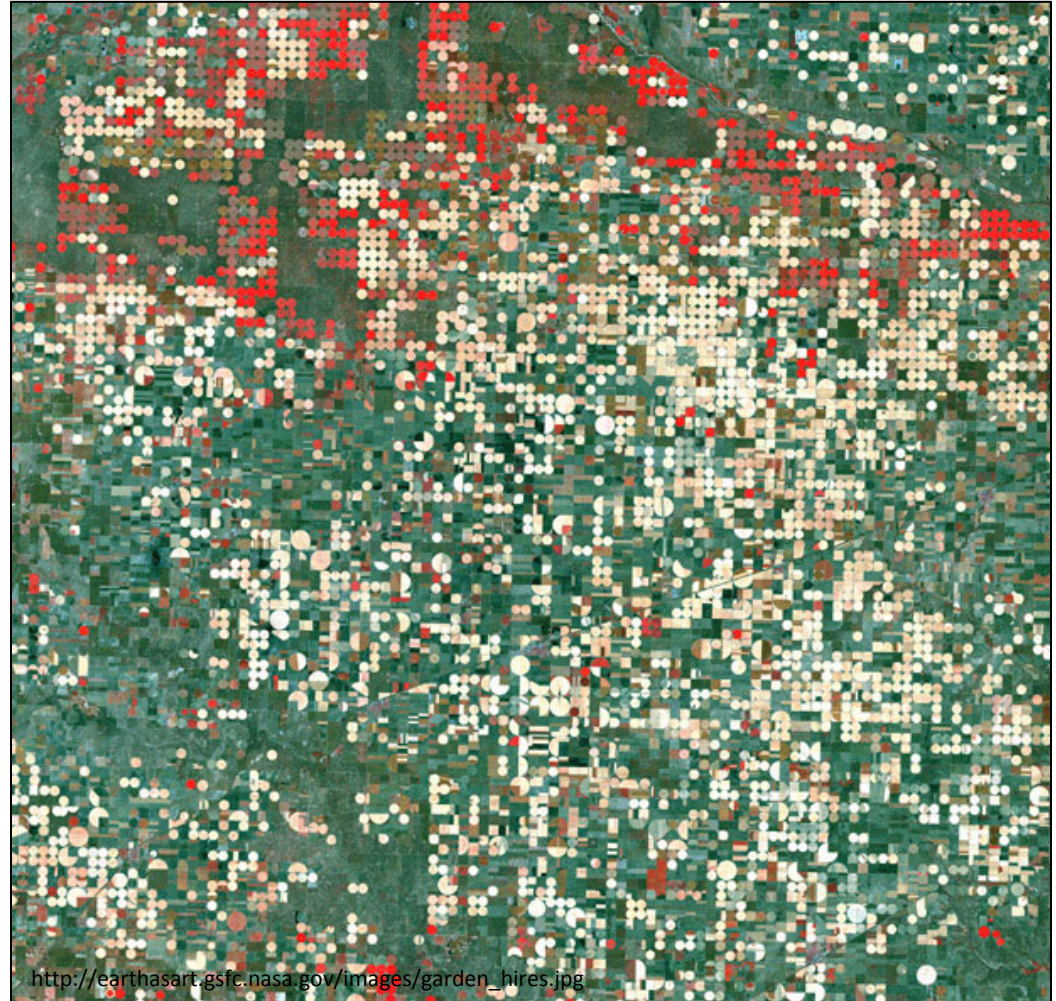
- General presentation of how imagery interpretation has changed in the Google Earth era
 - Audience: Professionals from varying fields with interest in imagery interpretation
- Internal lessons learned document from teaching
 - Audience: Internal employees directly or indirectly involved in the training

Methodology



Elements of Imagery Interpretation

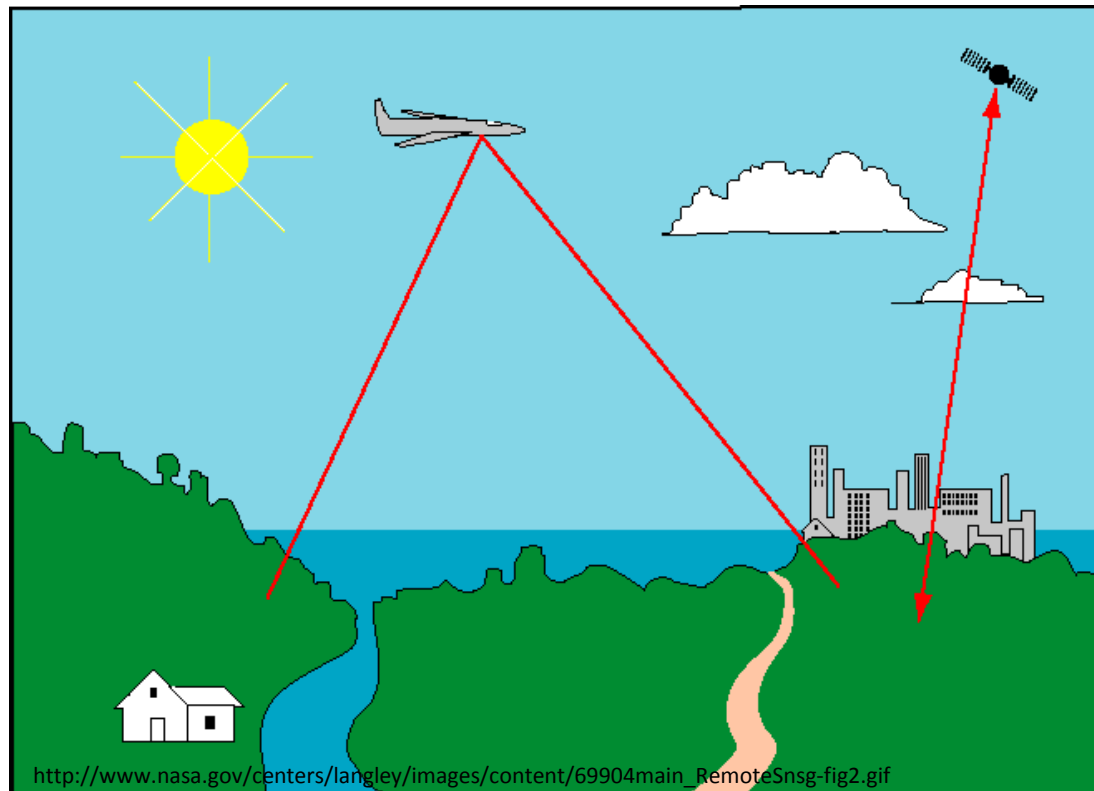
- Tone/Color
- Size
- Shape
- Texture
- Pattern
- Shadow
- Site/Association
- Height and Depth



Knowledge Needed for Imagery Interpretation

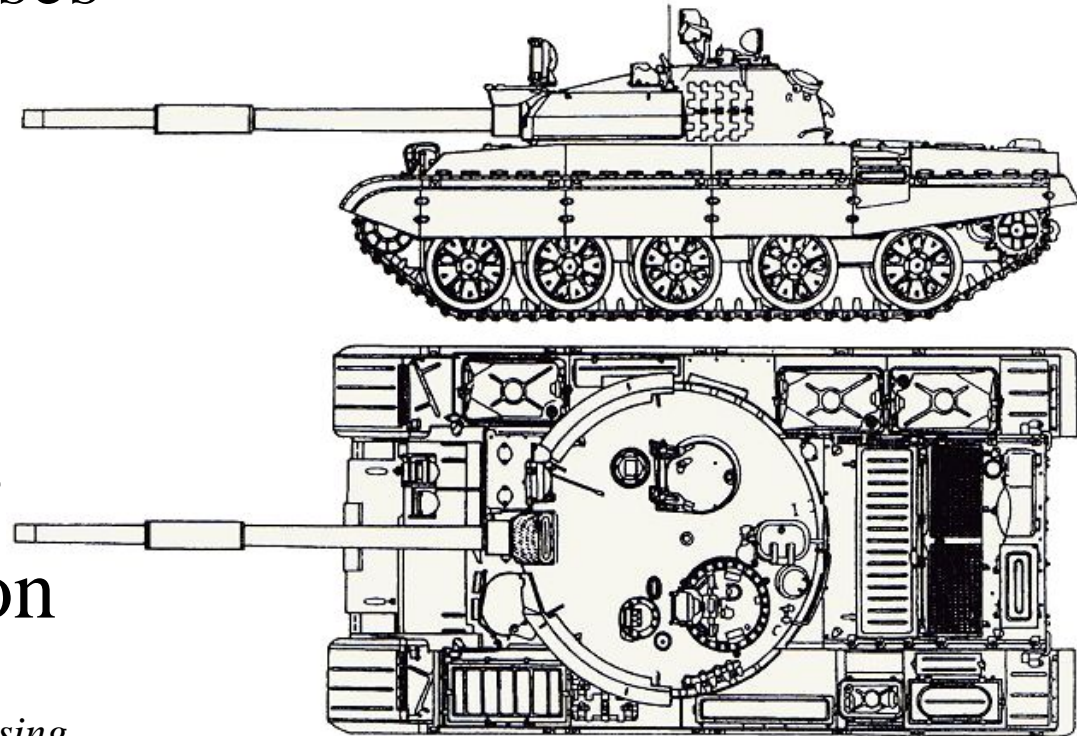
- Subject
- Geographic region
- Remote sensing system

Campbell (2011), *Introduction to Remote Sensing*

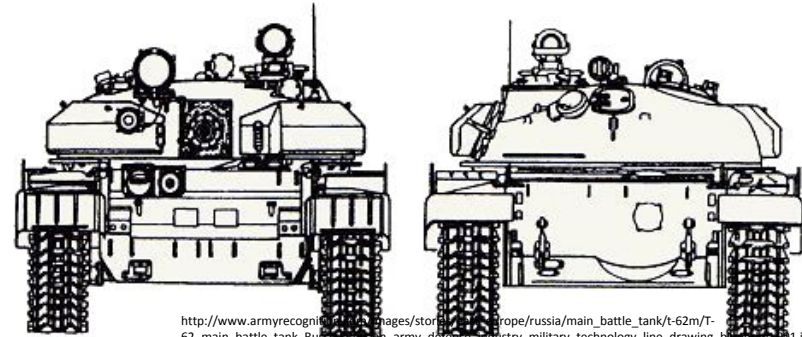


Other Frameworks

- Discipline specific uses
- Imagery keys
- Tasks
- Strategies
- Interpretive overlays
- Collateral information

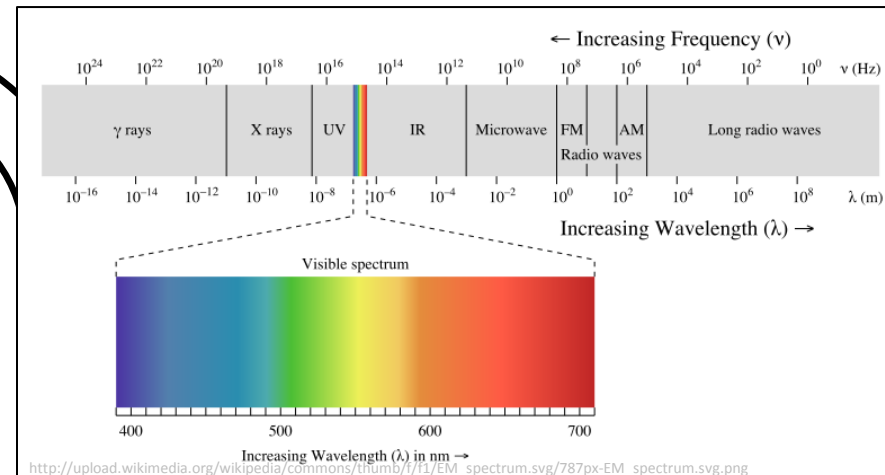


Campbell (2011), *Introduction to Remote Sensing*



Anticipated Results

- What elements of image interpretation, as classically taught, are less relevant since Google Earth?
 - Issues specific to hardcopy format
 - Orthorectification
 - Mosaicking
 - Pre-processing
 - Non-visible spectrum
 - Equipment
 - Software
 - Collection strategies
 - Stereo



Anticipated Results

- What old concepts still hold true?
 - Datums/Projections
 - Spatial and temporal resolution
 - Electromagnetic phenomenology
 - Accuracy
 - Confidence levels
 - Interpretation process
 - Measure tool limitations
 - Where is “up” on the image
 - Change detection

Anticipated Results

- What are new capabilities with Google Earth?
 - Comprehensive, fast, easy to collaborate
 - Complete coverage from various sources
 - Can zoom out indefinitely
 - Scale dependent datasets
 - Free
 - Cloud
 - 3D
 - Gazetteer
 - Layers
 - Interface with professional software
 - Developer “friendly”
 - .kml/.kmz easily shared
 - Speed

Anticipated Results

- What are the lessons learned in teaching imagery interpretation with Google Earth?

- Instructor observations:

- “Snap judgment” of the amateur
- Ground photo to overhead imagery

correlation

- Currency of imagery
- Terrain data
- Accuracy and precision of coordinates
- Sources of imagery
- Copyright
- Coordinate format
- How to make products
- The “Jack Bauer” effect



“Everyone” Has Seen Satellite Imagery



“I was always under the assumption that Google images were instant and real-time. I have no idea why I thought that but I just did.”

Going Forward

- **August 2014** - Teaching imagery interpretation with Google Earth
- **September - December 2014** - Analyze totality of student feedback
- **November 2014** - Submit abstract to AAG
- **February 2015** - Write report
- **March 2015** - Create presentation for AAG
- **April 2015** - AAG conference



Sources Cited

- Aronoff, S. (2005). *Remote sensing for GIS managers*. Redlands, Calif.: ESRI Press.
- Campbell, J. B. (2011). *Introduction to remote sensing* (5th ed.). New York: Guilford Press.
- Colwell, R.N. (1997). *Manual of Photographic Interpretation*, American Society for Photogrammetry & Remote Sensing
- Jensen, J. R. (2007). *Remote sensing of the environment: an earth resource perspective* (2nd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Lee, W. T. (1922). *The face of the earth as seen from the air: a study in the application of airplane photography to geography*. New York: American Geographical Society.
- Lillesand, T. M., & Kiefer, R. W. (2007). *Remote sensing and image interpretation* (6th ed.). New York: Wiley.
- McGlone, J.C. (2004), *Manual of Photogrammetry*, 5th Ed., Bethesda: ASP&RS, 1151 p.
- Philipson, W. (1997) *Manual of Photographic Interpretation*, 2nd Ed., Bethesda:ASP&RS, 555 p.

Questions?

