Shahrood University of Technology

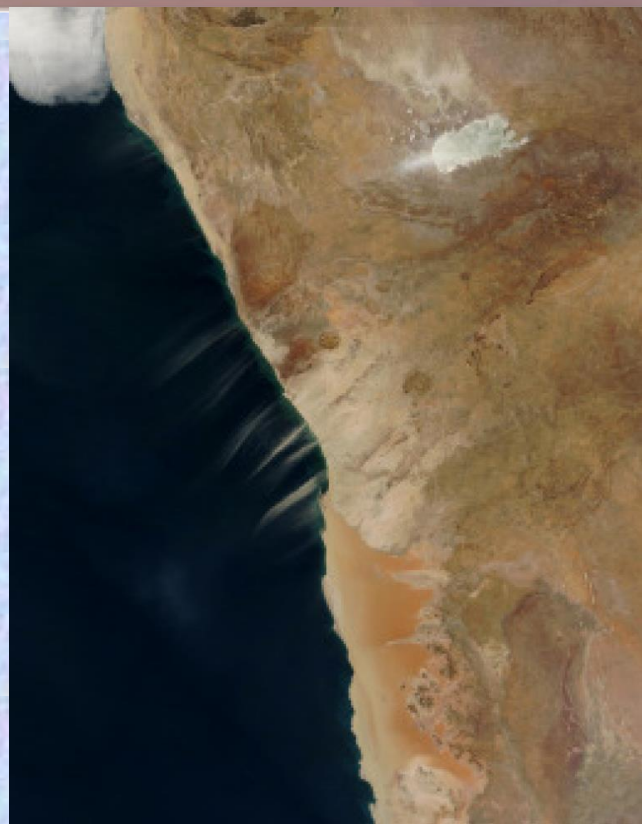
Introduction to GIS and Remote Sensing

Lectures 1 and 2: Introduction to RS and EMR

Mansour Ziaii
Shahrood Unv. Tech.

Structure

- **History of RS**
- **Components of remote sensing**
- **Introduction to understanding RS images**
- **Summary**



Origins of Remote Sensing

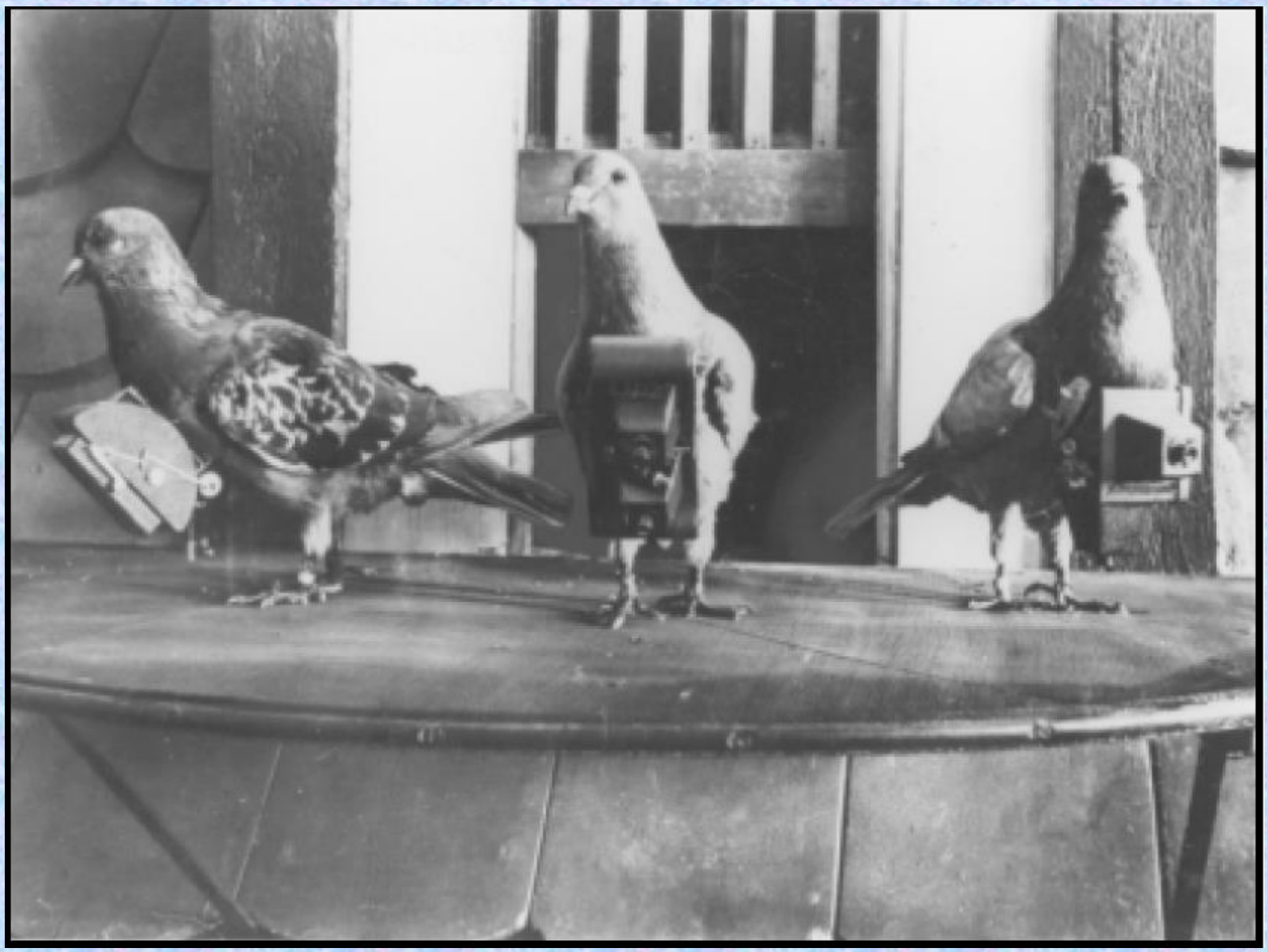
First photographs taken in 1839m.(1218 h.sh.)

1859 Gasper Felix Tournachon "Nadar" takes photograph of village of Petit Bicetre in France from a balloon

اولين عكس هوائي از روستاي اطراف پاريس گرفته شد كه بنام نادار معروف شد.

Boston by Black and King (1860)-1239 h.s

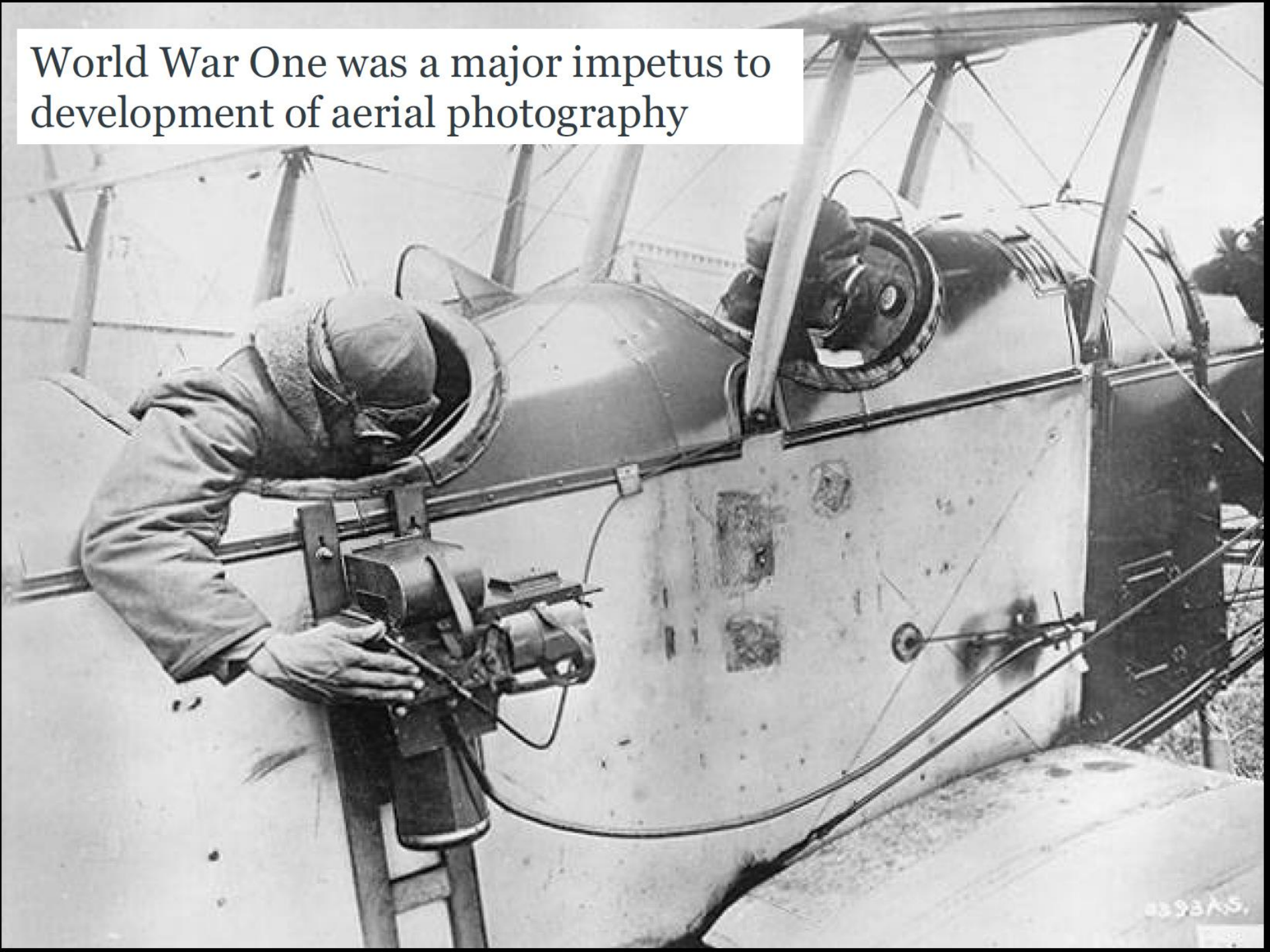
اولین عکس هوائی از شهر بوستون
از ارتفاع ۴۰۰ متری با استفاده از بالن

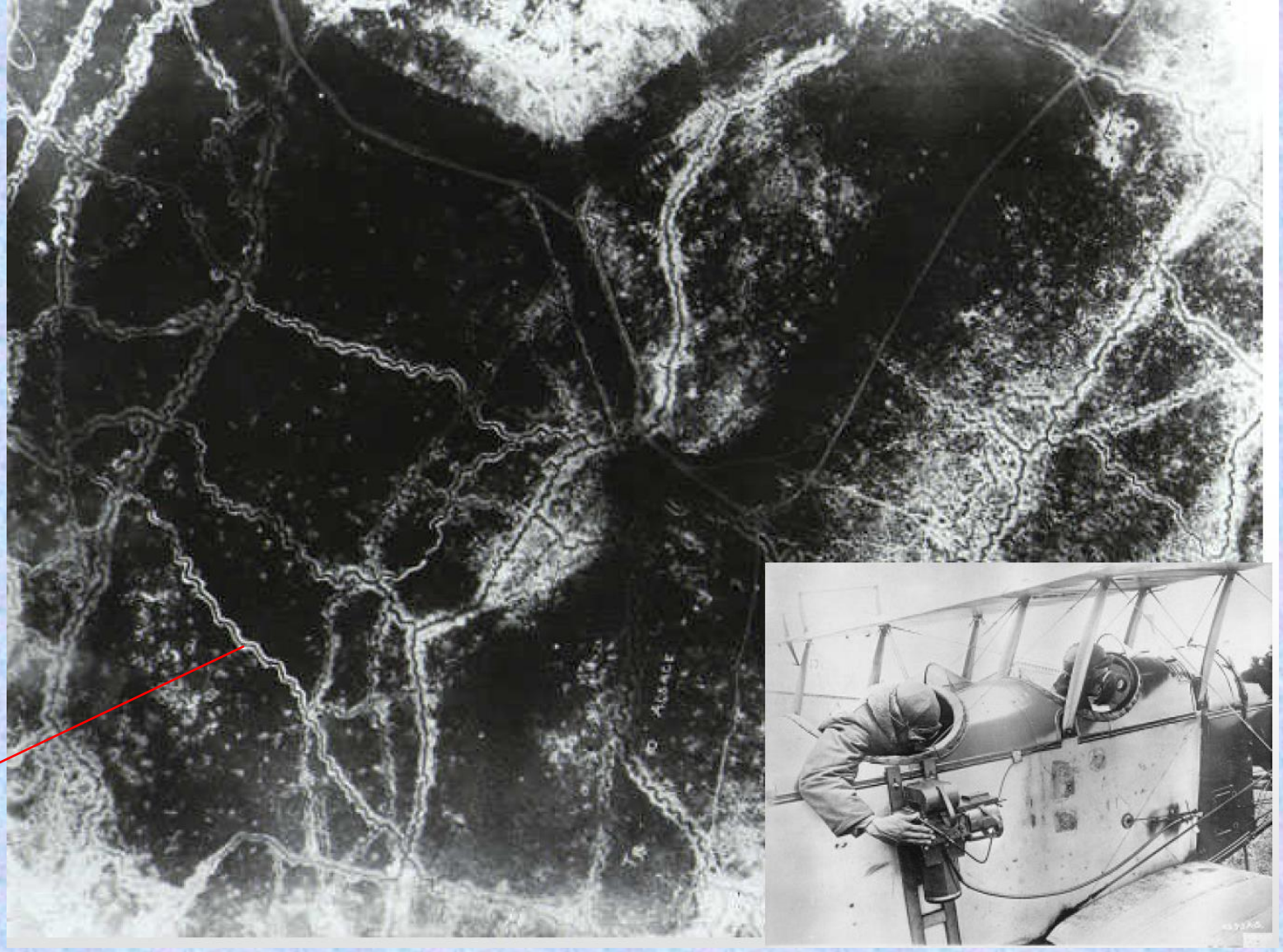


Picture taken by the Pigeons of a Bavarian castle

(the irregular objects on either side are the flapping wings)

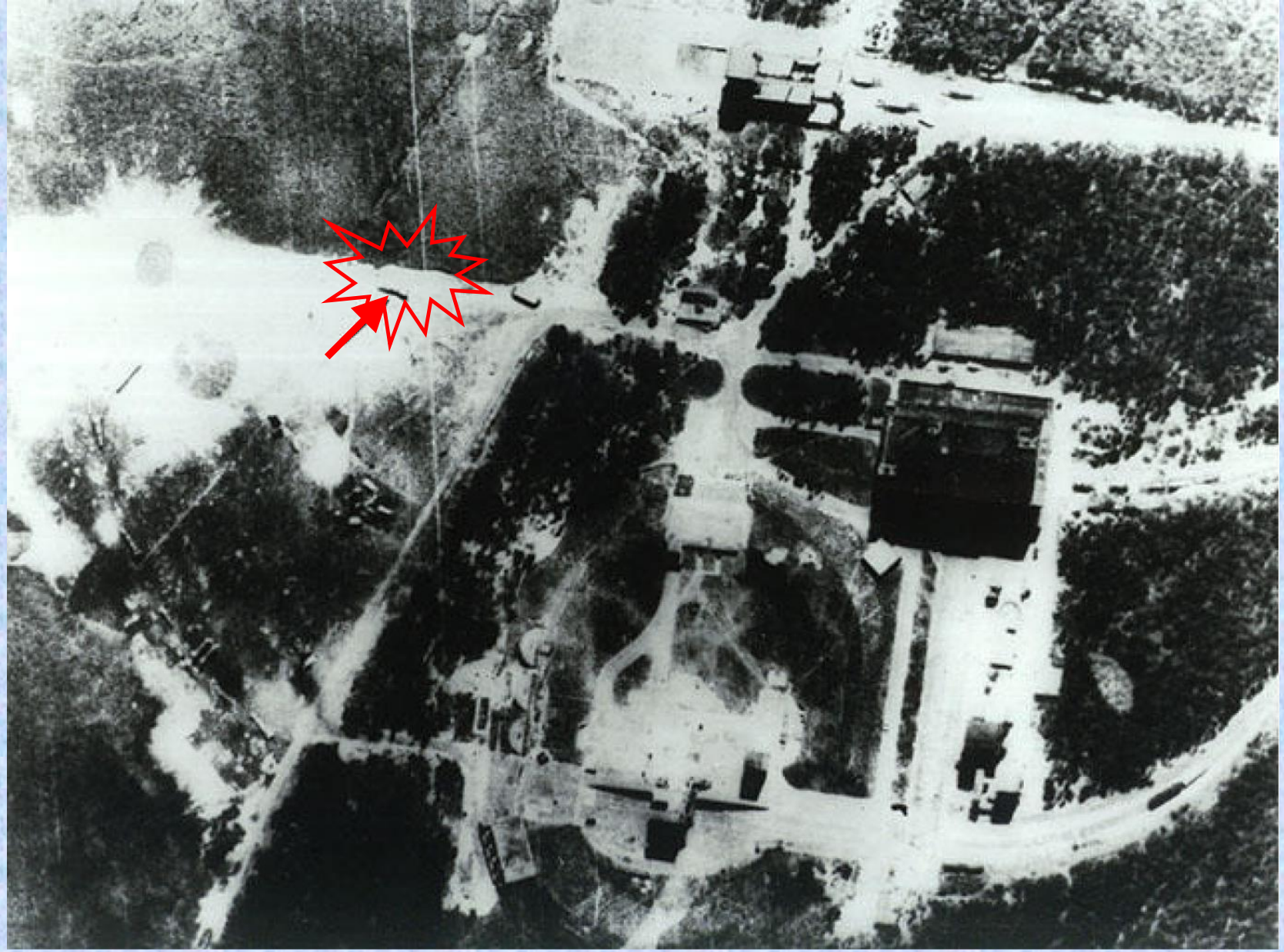
World War One was a major impetus to development of aerial photography





The zigzag pattern of World War I trench systems could be viewed best from the air.

From the National Archives.



Photos such as these helped Allies to understand the nature of reported new German "secret weapons" research. Arrow indicates V-2 rocket lying on its side.

After the war the technology was in place to begin large scale aerial surveys

A Brief Chronology of Remote Sensing

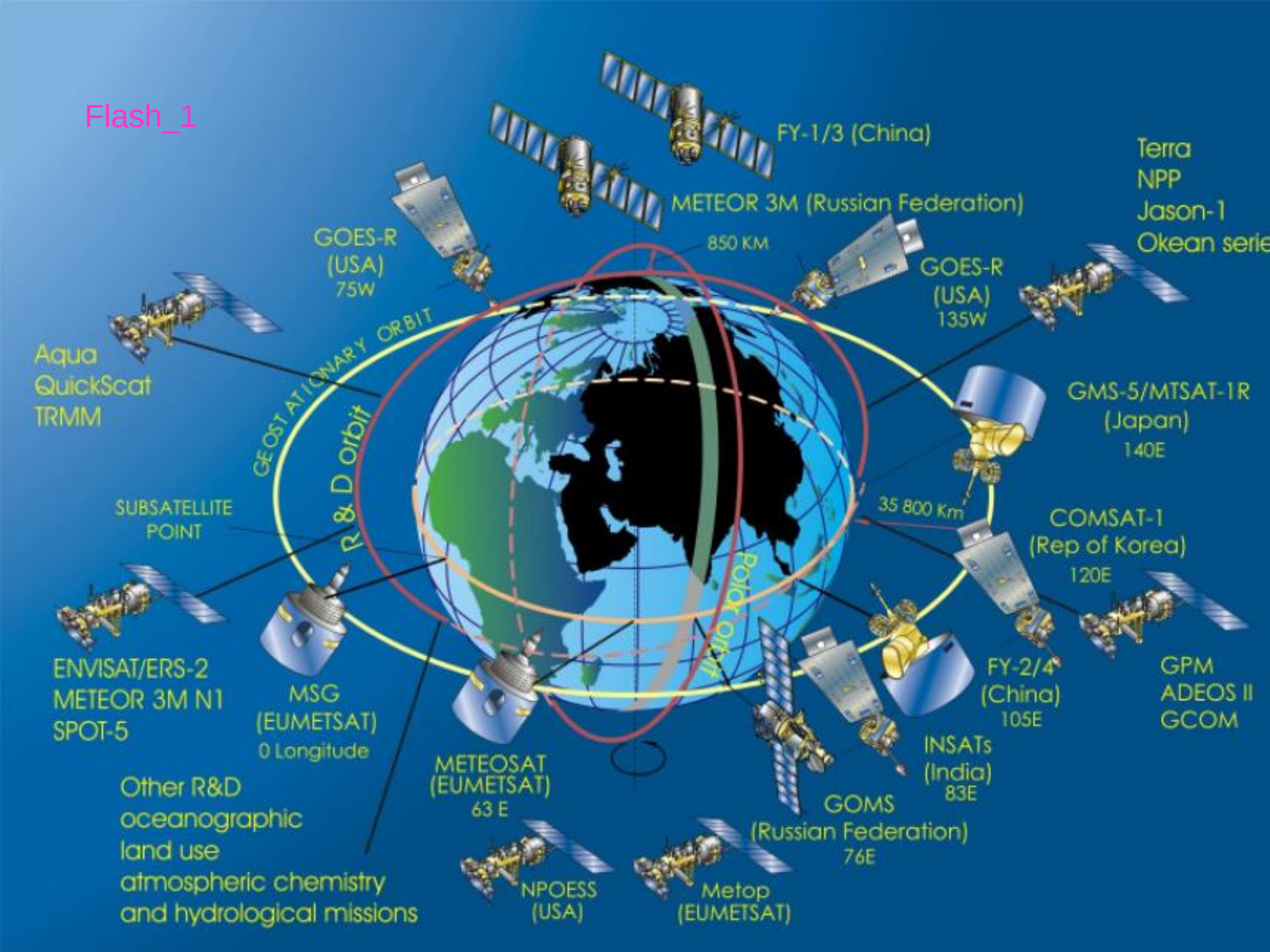
1960's First meteorological satellites (TIROS-1).

1972's Launch of the first generation of Earth resource satellites (Landsat - 1).
1351 Setting up of International Remote Sensing Bodies. Digital analysis was born.
1975 (Landsat - 2),…... (Landsat - 5).

1980's Setting up of Specific Remote Sensing Journals
Continued deployment of Earth Resource satellites by NASA
Development of the hyperspectral sensor (200 + band).

1990's Launch of earth resource satellites e.g. Terra-1 by national space agencies.

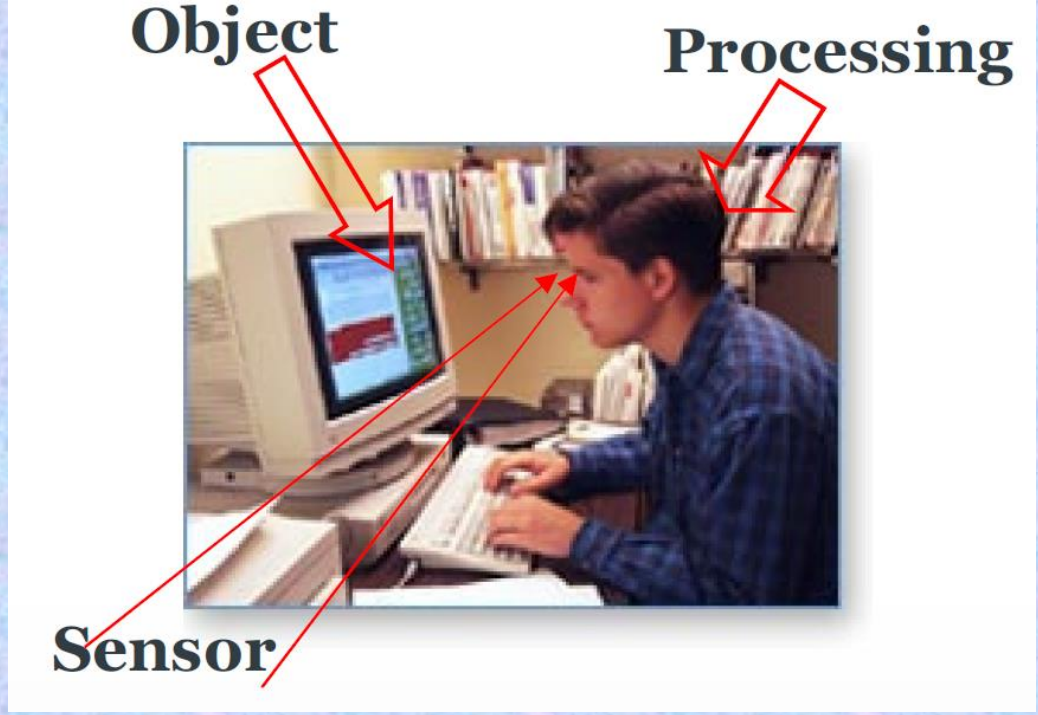
2000's Cheap targeted satellites.


Flash_1
FY-1/3 (China)
METEOR 3M (Russian Federation)
850 KM
Terra
NPP
Jason-1
Okean serie
GOES-R
(USA)
75W
GOES-R
(USA)
135W
Aqua
QuickScat
TRMM
GEOSTATIONARY ORBIT
R & D orbit
GMS-5/MTSAT-1R
(Japan)
140E
SUBSATELLITE
POINT
35 800 Km
COMSAT-1
(Rep of Korea)
120E
Polar orbit
ENVISAT/ERS-2
METEOR 3M N1
SPOT-5
MSG
(EUMETSAT)
0 Longitude
FY-2/4
(China)
105E
GPM
ADEOS II
GCOM
METEOSAT
(EUMETSAT)
63 E
INSATs
(India)
83E
GOMS
(Russian Federation)
76E
Other R&D
oceanographic
land use
atmospheric chemistry
and hydrological missions
NPOESS
(USA)
Metop
(EUMETSAT)

What is remote sensing?

سنجش از دور يعني علم و هنر كسب اطلاعات در مورد اجسام، اراضي يا پديده هاي مختلف، بدون تماس با آنها

A common observation: Human vision

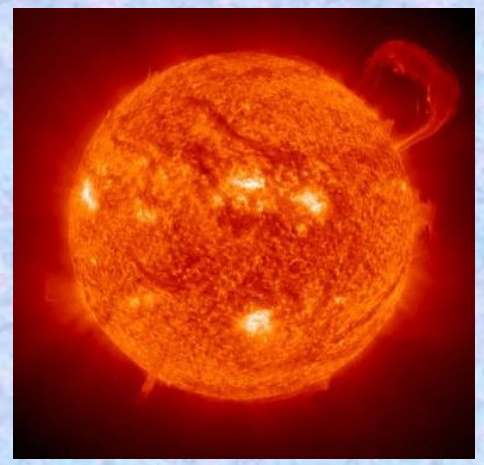


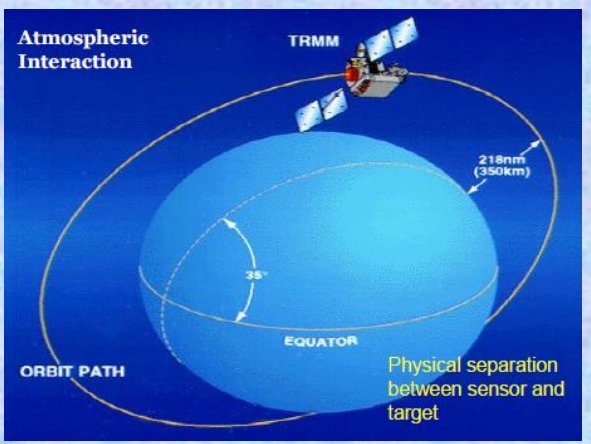
“The use of electromagnetic radiation sensors to record images of the environment, which can be interpreted to yield useful information”

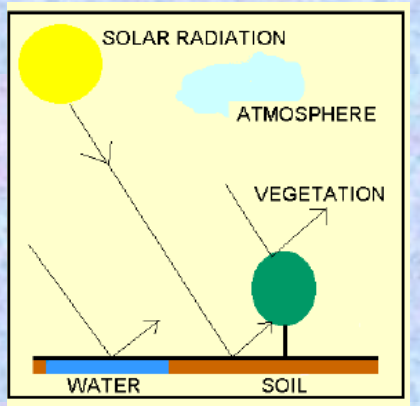
(Curran, 1985)

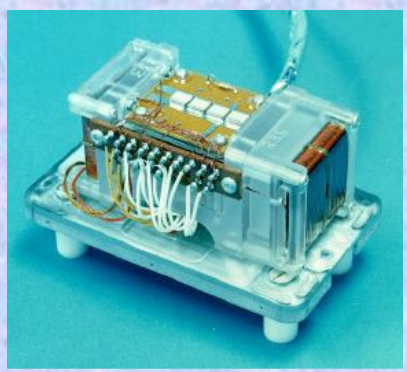
Has 4 main Components

- **Source**
- **Atmospheric interaction**
- **Interaction with Earth's surface**
- **Sensor**

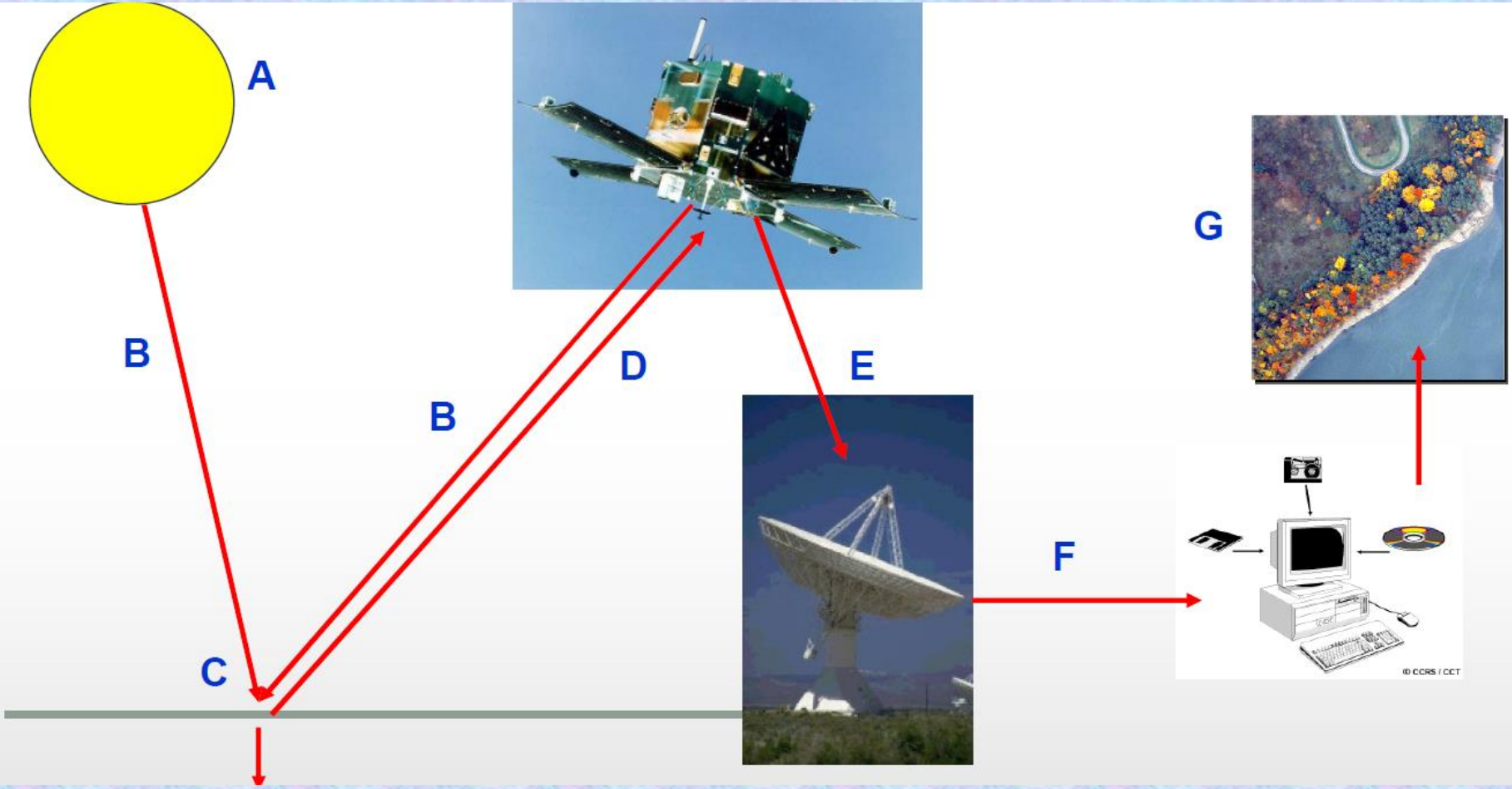






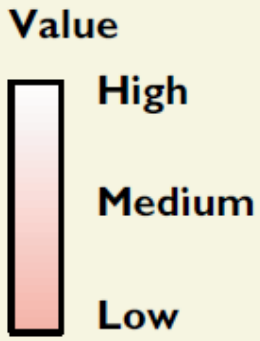


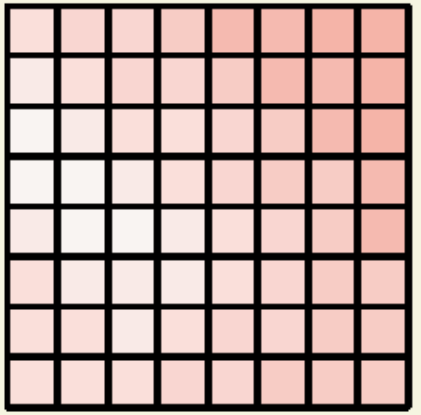
Main components of remote sensing



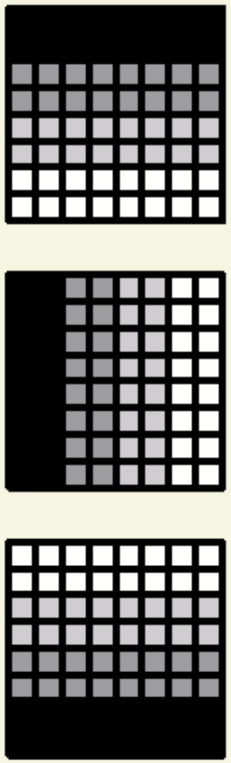
A = Energy Source, B = Radiation and the atmosphere, C = Interaction with the target, D = Recording of energy by the sensor, E = Transmission, reception and processing, F = Interpretation and analysis, G = Application

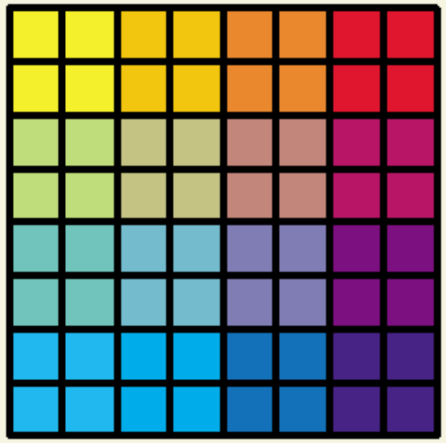
digital numbers?





Flash_colour filter





Attribute values range from 0 to 255 in each band

0

255

21	17	17	18	22	18
18	16	17	19	24	19
21	19	19	19	22	22
26	23	21	20	18	21
24	23	18	16	20	19
18	14	16	17	19	20

21.1	17.3	17.2	18.1
18.5	16.2	17.3	19.1
21.0	19.1	19.4	19.2
26.3	23.1	21.6	20.5

Colour Composites: spectral

‘Real Colour’ composite

Red band on red

Green band on green

Blue band on blue

Approximates “real” colour (RGB colour composite)

Landsat TM image of Swanley, 1988

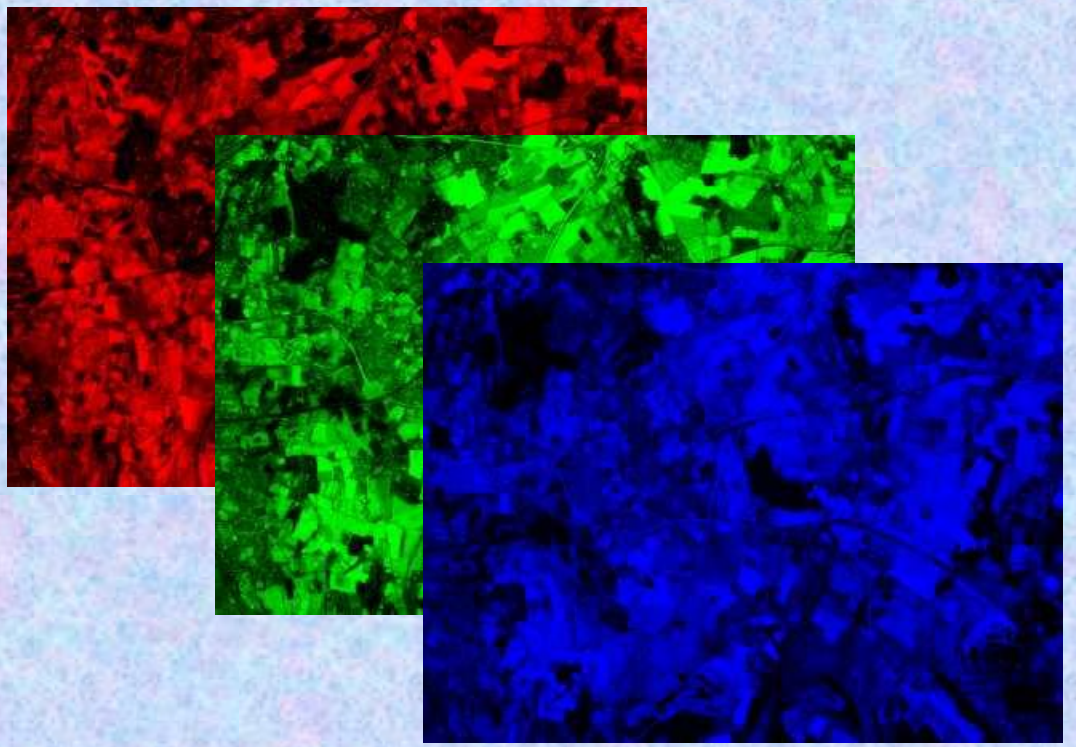
Colour Composites: spectral

‘False Colour’ composite (FCC)

NIR band on red

red band on green

green band on blue



Colour Composites: spectral

‘False Colour’ composite

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green band on blue