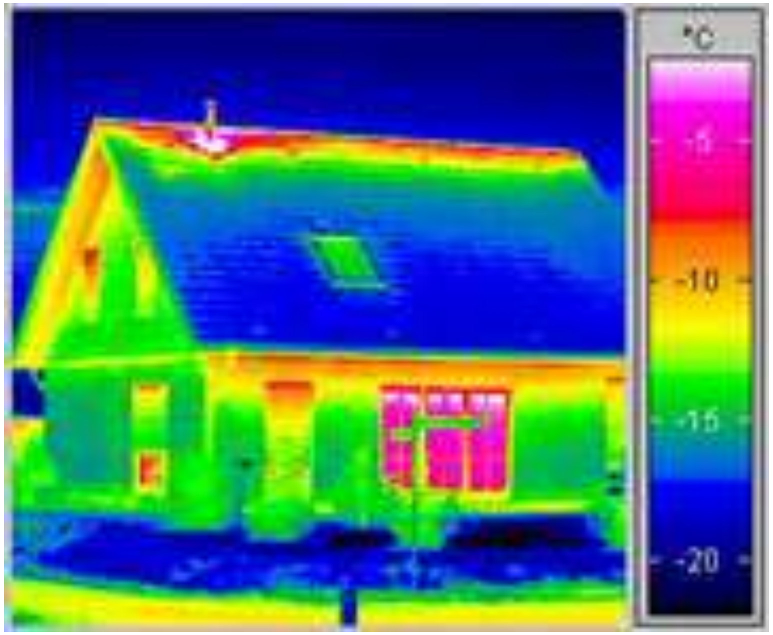
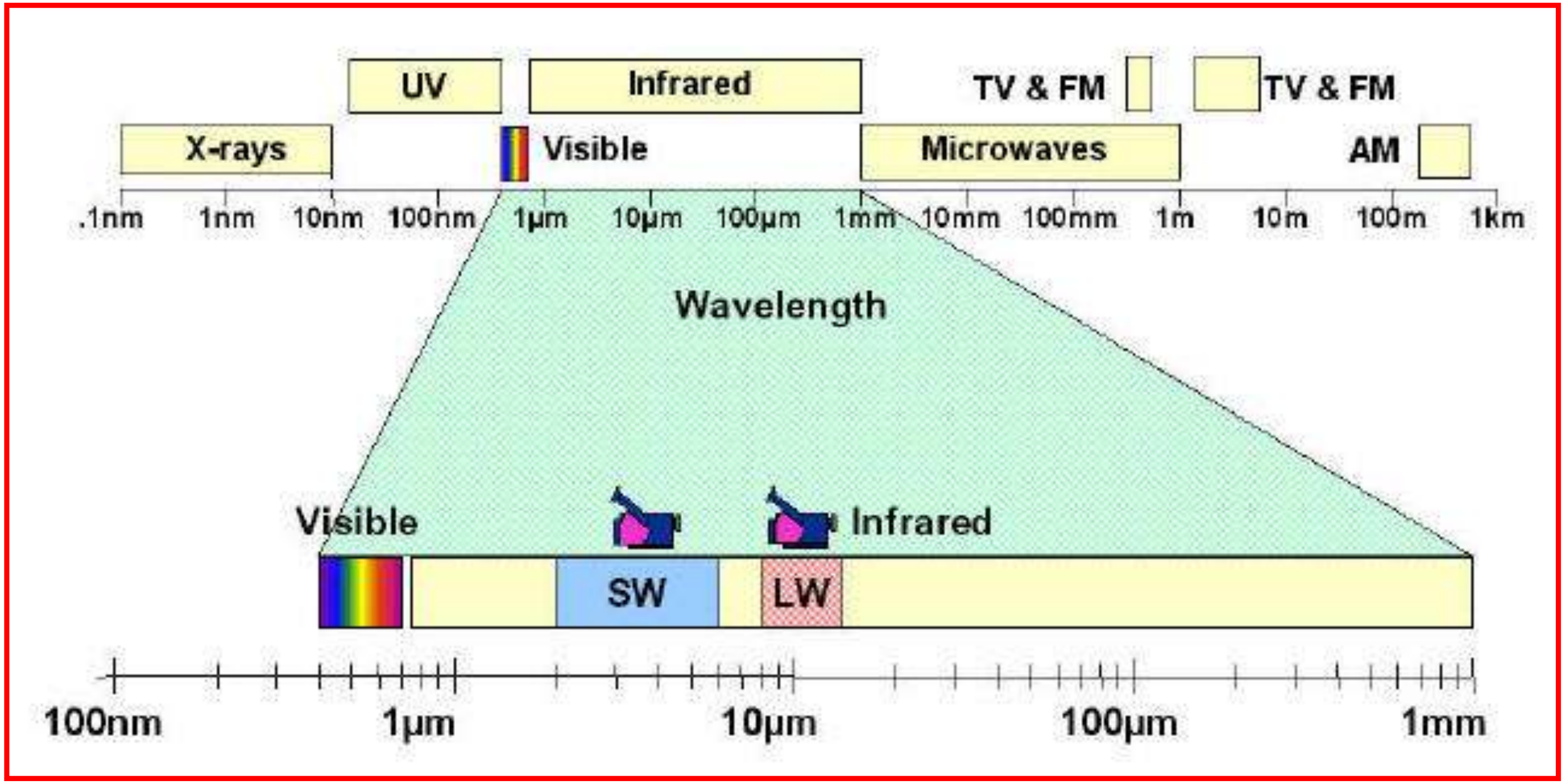
Wheatley Thermal Imaging project



Electromagnetic Radiation



The “Infrared” is a chunk of the electromagnetic spectrum

Everything Radiates

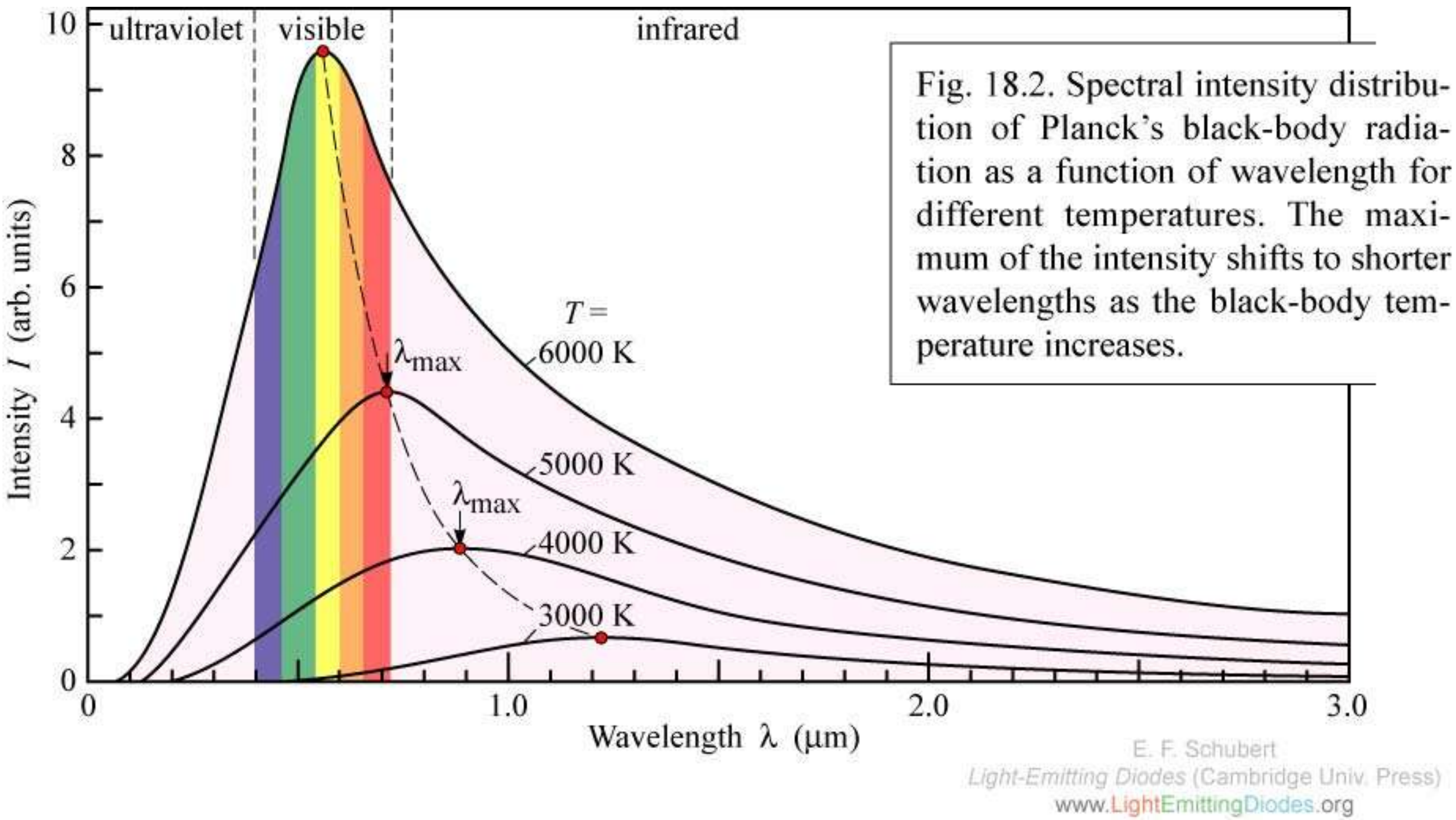


Fig. 18.2. Spectral intensity distribution of Planck's black-body radiation as a function of wavelength for different temperatures. The maximum of the intensity shifts to shorter wavelengths as the black-body temperature increases.

The **wavelength** of the radiation is a function of temperature

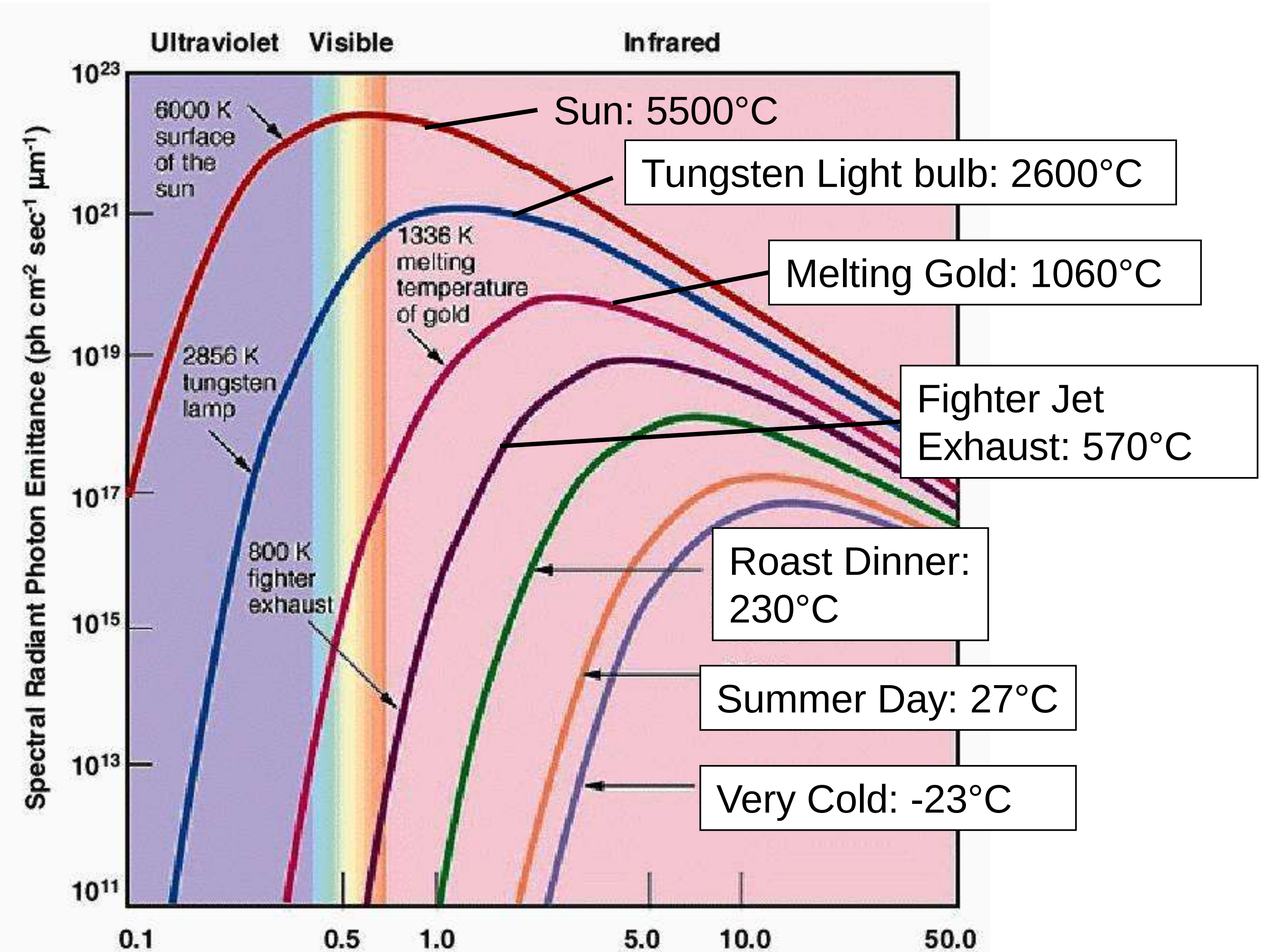
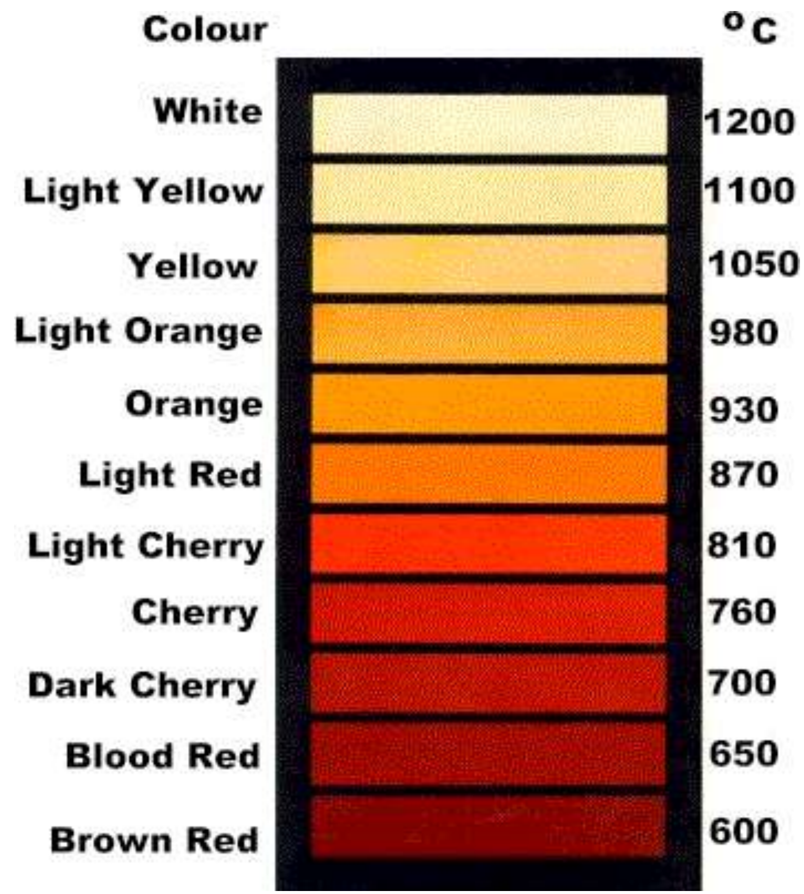

Ultraviolet
Visible
Infrared
Sun: 5500°C
Tungsten Light bulb: 2600°C
Melting Gold: 1060°C
Fighter Jet Exhaust: 570°C
Roast Dinner: 230°C
Summer Day: 27°C
Very Cold: -23°C
6000 K surface of the sun
1336 K melting temperature of gold
2856 K tungsten lamp
800 K fighter exhaust
Spectral Radiant Photon Emittance (ph cm-2 sec-1 µm-1)
10^23
10^21
10^19
10^17
10^15
10^13
10^11
0.1
0.5
1.0
5.0
10.0
50.0
Wavelength (µm)

Fig. 2

Colour change of steel



Infrared Imaging

- There is still a ‘colour change’ at low temperatures, but the ‘colours’ are in the infrared – invisible to the human eye.
- Infrared cameras detect the radiation and calculate the temperature of the object
- The colours on a printed infrared image are artificial .. usually **black/blue** for cold and **red**/**yellow** for hot

Infrared Cameras

Infrared Cameras measure the **temperature** of the surface they are pointed at

- Some of them give an instantaneous display.
- Most of them will save the ‘pictures’ digitally:
  - these can then be downloaded to a computer
  - Software allows you to manipulate the colours to print out useful pictures.

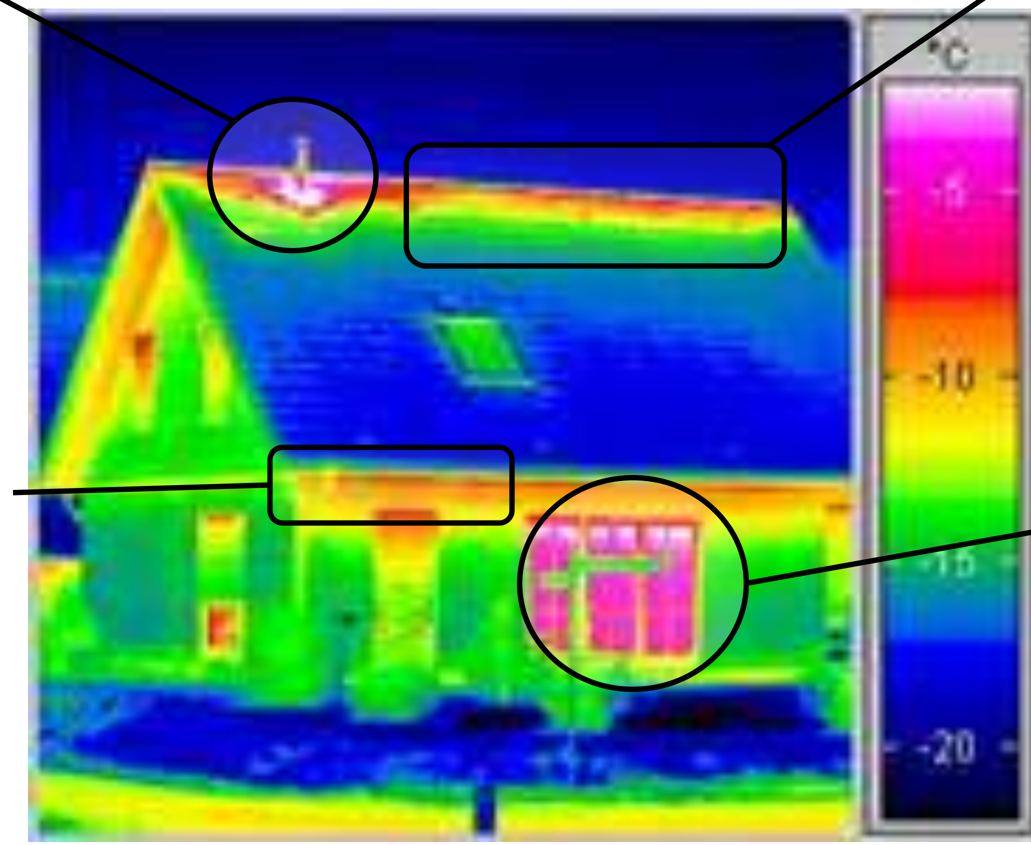
When can you use an Infrared Camera ?

- The ambient temperature must be low
  - The inside of the house must be **hotter** than the outside for there to be any heat loss
- It must be dark
  - In sunlight, the roof of a house might be hot from solar radiation, not from heat leakage
- The outside of the house should be dry
  - A wet surface will appear **colder** than a dry surface due to evaporation

Example – Outside of a House

The roof is hot around the chimney

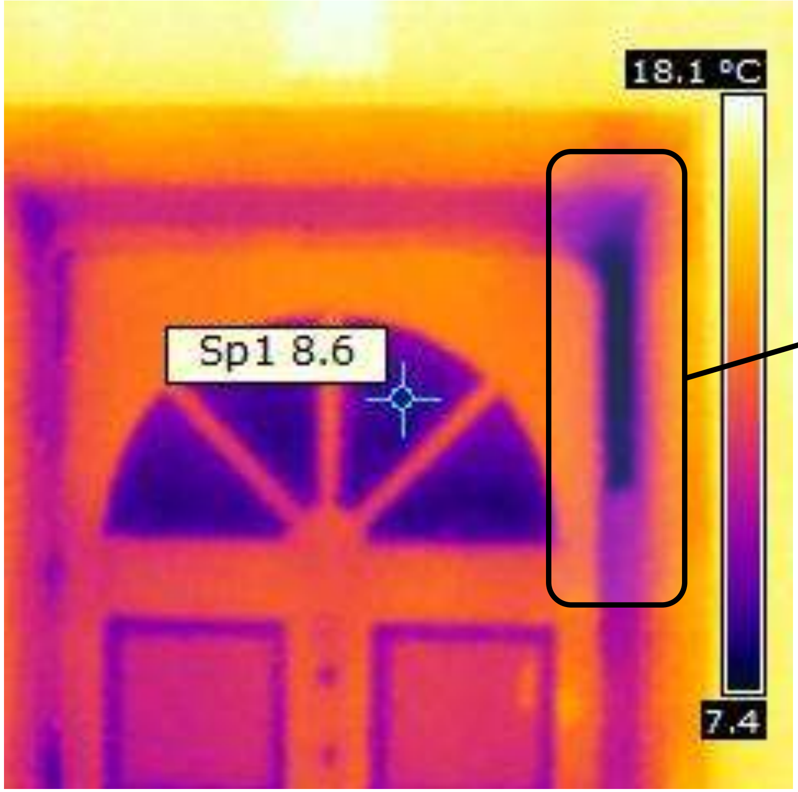
Air Vented to roof space?



Cavity Fill sagged; no insulation at top of walls?

Single Glazed Windows?

Example – taken from inside



Cold spot: no draught-proofing?

Thermal Imaging in Wheatley

South Oxfordshire District Council own a thermal imaging camera that they lend out.

SODC have agreed that their camera will be loaned to us (Wheatley CAG) and groups in Stanton St John and Forest Hill for the period October to December 2011.

What we Plan to ‘Image’.

Wheatley is too large for us to image every house; we plan to take thermal images of:

- A selection of houses of different ages, built to different insulation standards
- Some well-insulated properties with similar un-insulated ones
- Some of the village’s public buildings

What do we want to achieve?

The aims of the project are to:

- ***To highlight energy loss from buildings in the village***
- ***To help people assess the buildings they live in, and show how they can be improved***
- ***To raise awareness that we can all help to combat climate change.***