All objects radiate energy as a result of their heat. If they are very hot, some of the radiation may be visible to the human eye, as in the case of the sun, a red-hot coal, or an electric light bulb. But for most objects at ordinary temperatures the radiation is in the infrared band, invisible to the eye but detectable by an infrared sensor. The wavelength of the radiation (its "colour") depends on the temperature, so that an object slightly warmer than its immediate surroundings will be distinguishable. This makes infrared surveillance particularly useful for the detection of rockets, ships, aircraft, and land vehicles, whose engine exhausts are much hotter than the immediate surroundings, and gives it special potential for use in the Arctic winter.

The band of wavelengths usually employed by various airborne or spaceborne radars is proportionately wider than the visual band, but narrower than the infrared band. However, it is technically difficult to make any one powerful radar operate at widely different wavelengths,[27] and the normal use in surveillance corresponds to illumination of the target area with radiation of a single "colour".

Human (and animal) vision is very sensitive to any rapid movement in a scene under observation. This advantage is lost in a still photograph (whether taken by visible or IR light), examined some time after exposure. A succession of still photos taken at intervals can be compared for any differences. This is a tedious business to carry out visually, but there are electronic means of identifying differences. Such delayed methods are more useful for detecting changes over periods of days or weeks, rather than for observing objects in motion.

With radar, it is possible to detect motion during the moment of observation. The precise frequency and phase of the energy transmitted by the radar is known, and can be stored for subsequent reference. If the radar itself is stationary, energy reflected from

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[27] The physical size of many of the components associated with a radar must be matched to the size of the wavelength to avoid prohibitive losses when handling the energy. A component designed for one wavelength will not function effectively with another that is much different.