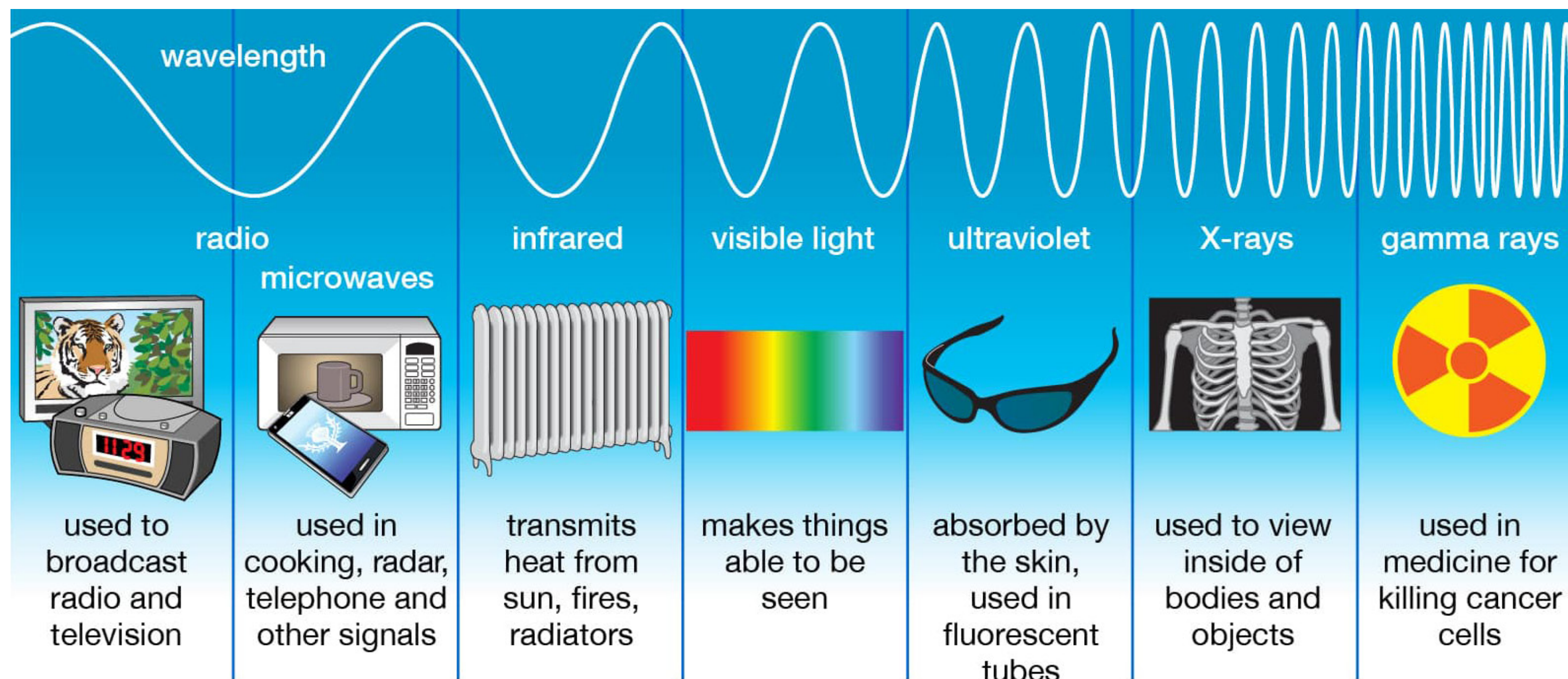


SPACE TELESCOPES

Astronomers study the universe by observing all types of electromagnetic radiation from space



Types of Electromagnetic radiation

What is the electromagnetic spectrum?

The electromagnetic spectrum is the range of all types of electromagnetic radiation. Radiation is energy that travels and radiates out – the visible light from a lamp in your house and the radio waves from a radio are two types of electromagnetic radiation. The other types that make up the electromagnetic spectrum include microwaves, infrared light, ultraviolet light, X-rays and gamma rays.

You know more about the electromagnetic spectrum than you may think. The image above shows where you might encounter each portion of this spectrum in your day-to-day life.

Why do we need telescopes in space?

- The Earth's atmosphere lets through radio waves, microwaves and visible light. Some other wavelengths that form part of electromagnetic radiation, such as gamma rays, X-rays and most ultraviolet and infrared light, cannot be observed from the ground as they are blocked by the Earth's atmosphere.
- Our atmosphere acts like a protective blanket that lets only some electromagnetic wave lengths through while blocking others. Placing telescopes in space, beyond the Earth's atmosphere, is the only way to see what the universe looks like at those wave lengths that are blocked by the atmosphere.
- The main reason why we place telescopes in space is therefore to avoid atmospheric disturbance so that we can obtain a clearer view of the planets, stars and galaxies that we are studying.
- In addition, atmospheric turbulence (movements in the atmosphere that wiggle the light waves from distant objects) blur the light travelling through it, which causes objects to twinkle and appear fuzzy. This wiggling results in a blurred image that is not as crisp as that provided by space-based telescopes that take their images from above the atmosphere. You see this blurring in action every night – atmospheric turbulence is what makes stars twinkle.
- If we chose to only observe from the Earth we would make ourselves blind to a wide variety of astronomical phenomena and potential discoveries. These would include some of the universe's most energetic events.

What do space telescopes observe?

- Space telescopes observe at wavelengths from near infrared through the visible range and into the ultraviolet.
- Astronomers examine infrared wavelengths to study the early universe and to learn about objects that are too cold to generate visible light, including brown dwarf stars and dust clouds.
- X-ray telescopes make it possible to study objects with temperatures between about one million and 100 million °C. When atoms in a gas are this hot they move so fast that, when they collide, they emit X-rays.
- Examining gamma rays allows astronomers to study active galactic nuclei, gamma-ray bursts, pulsars and solar flares. Gamma-ray telescopes do not use mirrors at all but instead have special detectors that measure the energy and direction of these highly energetic rays.