Microscopic techniques

Microscopy is the technique used to view objects that cannot be seen by the naked eye. The range can be anything between mm and nm. There are 3 main microscopic techniques that are used; Optical microscopy, Scanning probe microscopy and Electron microscopy.

Optical microscopy

Otherwise known as light microscopy, it involves the use-age of visible light and one or more lens to produce an enlarged image of an object that is placed in the focal plane of the lens. This can either branch off into transmission, where the beam of light passes through the sample or reflection where the beam reflects off the sample surface, i.e reflected light microscope. There are many applications to Optical microscopy such as in nanophysics and biotechnology but in medicine it is mostly known as being used in diagnosis when we are dealing with tissues or tests on free cells known as a smear test.

Scanning probe microscopy

This is another branch of microscopy that involves using a probe to scan the object. Basically it works by being moved around in a rectangular pattern known as raster scanning. A type of scanning probe microscopy is called STM (scanning tunneling microscopy) this is when a very sharp conducting tip is brought to the surface and a voltage is applied between them and we are able to find out the tunnel current and if this is maintained we can trace the elevation of the surface and thus produce it on an x-ray. There are advantages and disadvantages to SPM however, for example the major advantages being that small structures can be created as the interaction can be modified from the probe and unlike electron microscopy we do not need a vacuum. The disadvantages being that the maximum image is generally small and the detailed shape can be hard to distinguish of the scanning tip.

Electron microscopy

This is a form of microscopy that uses electron beams to create an image of the object being used. They have a much higher magnification than light microscopes and so a much higher resolution as a result, this allows us to see smaller specimens in greater detail. The resolution is able to be increased because as the electrons travel faster their wavelength becomes shorter so there is a direct correlation between reducing wavelength and increasing resolution. There are 2 types of electron microscopes used, Transmission and Scanning electron microscopes. TEM involves shooting a high voltage beam through a thin layer of specimen and gathering information about the structure . SEM in contrast produces images by detecting secondary electrons that have been emitted off the surface due to excitation by the primary electron beam. Therefore the electron beam across the surface is scanned in a raster pattern by mapping the detected signals with the beam position. While we do get a better quality image and different kinds of images due to TEM and SEM there are disadvantages. Unfortunately it is very expensive to build and maintain as it is sensitive to magnetic fields and needs a cool water supply running through the lens constantly. Since the electron microscope is a specialized instrument, a high level of training needs to be done to operate it.

Links

Related articles

External links

Bibliography

http://www.jic.ac.uk/microscopy/about.html