- Computed Tomography (CT)

  X-rays are used to obtain images. It operates according to the physical principle of transmission.

  Using multiple detectors, images in the form of sections of the living body are obtained. Scan times are too short

  The size, shape, density, location of the structures examined and the superposition is not formed in this diagnostic technique

  Computer manipulation is required on images

- Nuclear Medicine (Scintigraphy)

  - Gamma rays emitted from the patient are used to obtain images. Radioactive isotope agents given the patient by IV, oral, rectal than the images are obtained.
  - Radiopharmaceuticals used in the body are metabolized to the form of radiation gamma rays
  - Isotopes are bound to a specific agent in a specific area, such as bone and liver. Detects abnormal function, metabolic activity or abnormal intake. Scintigraphy is a weak method in terms of anatomical knowledge

- Magnetic Resonance Imaging (MRI)

  Only radiofrequency waves are used, ionizing radiation is not used

  Stimulation of hydrogen atoms in the living body with radiofrequency waves than receiving the sound waves creats the image

  - Cross section images are obtained

  - It is the ideal diagnostic method for viewing soft tissues. Especially the best for the central nervous system

- Radiotherapy

  Radiation is used for the treatment of neoplastic and some benign tumors and for alleviating the symptoms

  - Usually Cobalt and linear accelerators are used

  - Special education required

- Formation of X-rays

  X-rays result from the interaction of the rapidly moving electron current with the atoms of the target material. When the electrons interact with the target, they suddenly slow down and turn %1 of their kinetic energies to x-rays. The remaining 99% is lost as heat.

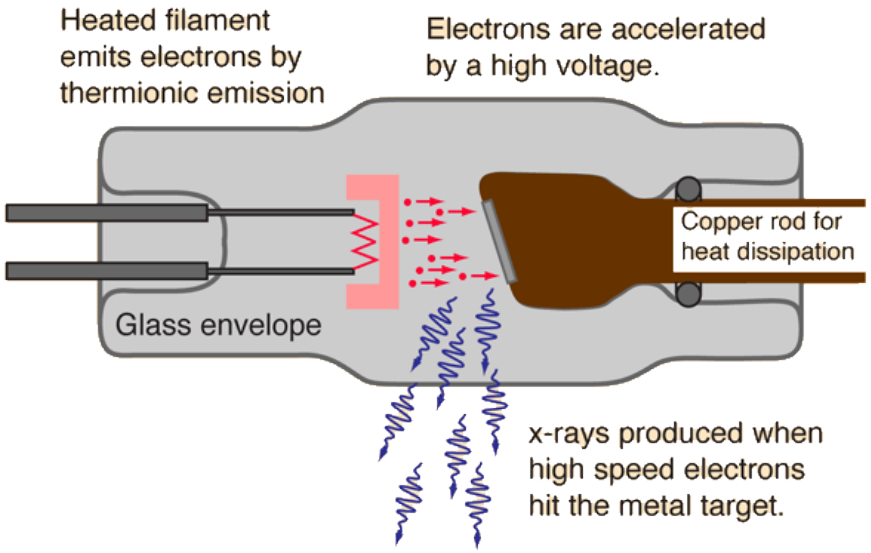
  There are three elements required for X-ray production
  1- Electron welding
  2- A target to be hit by electrons
  3- A way to accelerate electrons

- What is an X-ray?

  X-rays are a form of electromagnetic radiation obtained from the x-ray tube for the purpose of examining invisible parts of the organism. So x rays carry the Electromagnetic Wave Feature.

  In the x-ray tube, the electron flow from the cathode to the anode is called TUBE CURRENT or CATHODE RAY.

- When a high voltage was applied to the electrodes, electrons formed at the cathode would be pulled towards the anode and strike the copper with very high energy. Roentgen discovered that very penetrating radiations were produced from the anode, which he called x-rays. X-ray production whenever electrons of high energy strike a heavy metal target, like tungsten or copper. When electrons hit this material, some of the electrons will approach the nucleus of the metal atoms where they are deflected because of there opposite charges (electrons are negative and the nucleus is positive, so the electrons are attracted to the nucleus). This deflection causes the energy of the electron to decrease, and this decrease in energy then results in forming an x-ray. Medical x-ray machines in hospitals use the same principle as the Crooke's Tube to produce x-rays. The most common x-ray machines use tungsten as there cathode, and have very precise electronics so the amount and energy of the x-ray produced is optimum for making images of bones and tissues in the body.



- FEATURES OF X RAYS
  Although GAMA RAYS emitted from x-rays and radioactive materials with very short wavelengths are obtained from different sources, their properties are the same.

- - X-rays are invisible
  - X-rays are tapered out of the window of the tube
  - X-rays are heterogeneous structure varies energy and wavelength
    X-rays do not deviate in the magnetic field
    X rays have light speed
    X-rays decrease in intensity as they move away from the beam source
  - Penetration property
  - Absorbtion property
    It has ionization feature
    Has a photographic feature
  - Has chemical properties
  - Biological property and cause biological damage
  - Has fluorescence feature
  - Causes secondary rays

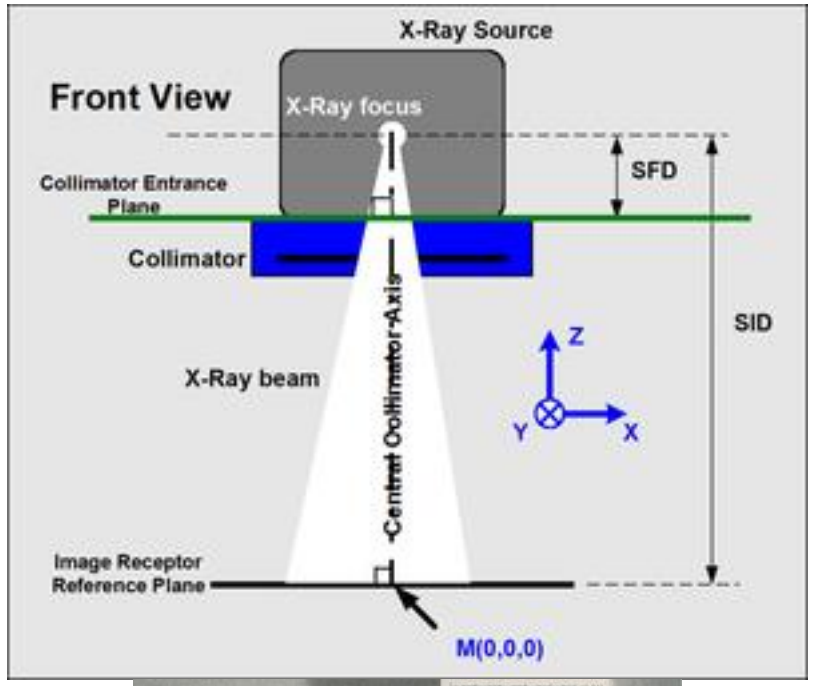
- **X-RAY EQUIPMENT and PARTS**
- x-ray tube
- Haube
- Filters
- Ancillary Parts of the X-ray Device

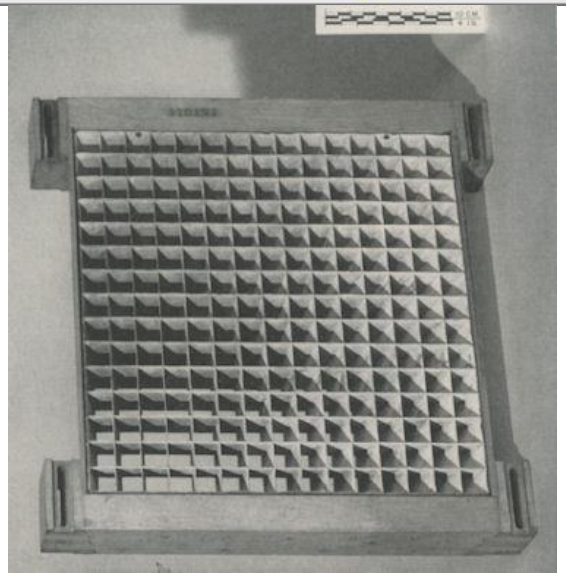
- **Ancillary Parts of the X-ray Device**

- Limits of primary and secondary rays and in this way makes quality radiograms

A- Limitation of Primary Rays: The limitation of the primary rays coming from the x-ray tube is called COLLIMATION. Thus, the size and size of the beam is checked. Increases radiation protection and protects personnel and improves image quality

B- Limitation of Secondary Rays: Bucky Assembly and Grids are equipmens used to minimize the impact of scattered secondary rays on the film. The grid system consists of 2 to 4 mm thick plates suitable for the dimensions of the cassette. For this purpose, there are specially made GRIDED CASSETTS.





- CONTROL BOARD

  *** What is kV and mAs and why is it important?

  Kilovolt (kV) control:

  The potential difference between the cathode and the anode is the volts.

  The wavelength of the x-ray to be obtained by kV, ie the penetration property, is determined. So we determine the quality of the x-ray.

  For this purpose, the required kV should be selected during irradiation according to the area to be radiographed.

- Miliamper (mA) Control

  Determines the amount of current to be applied to the cathode during irradiation. When the mA is increased, a more dense electron cloud is formed around the cathode and these electrons move from the cathode to the anode by irradiation.
- On high-demand radiographs, mA is held high. Thus, the detail can be examined on the radiogram.

  *** The mA control is effective only during the selected irradiation. For this reason, mA and duration (sec) factors are combined in the form of mAs. Thus, the quality of the x-rays is determined.

- **Radiographs**
- X-rays are sensitive to both visible light and x-rays.
  Changes in the film result from the interaction of X-rays with the emulsion layer in the film.
  In order to see these changes, bathing operations are done.
  After the bath, the beam area of the film becomes black, while the non-radiating sections are white and the other parts are gray.
- Evaluation of the film

  Radiogram; 2-D view of a 3D structure.

  With the examination of the film;

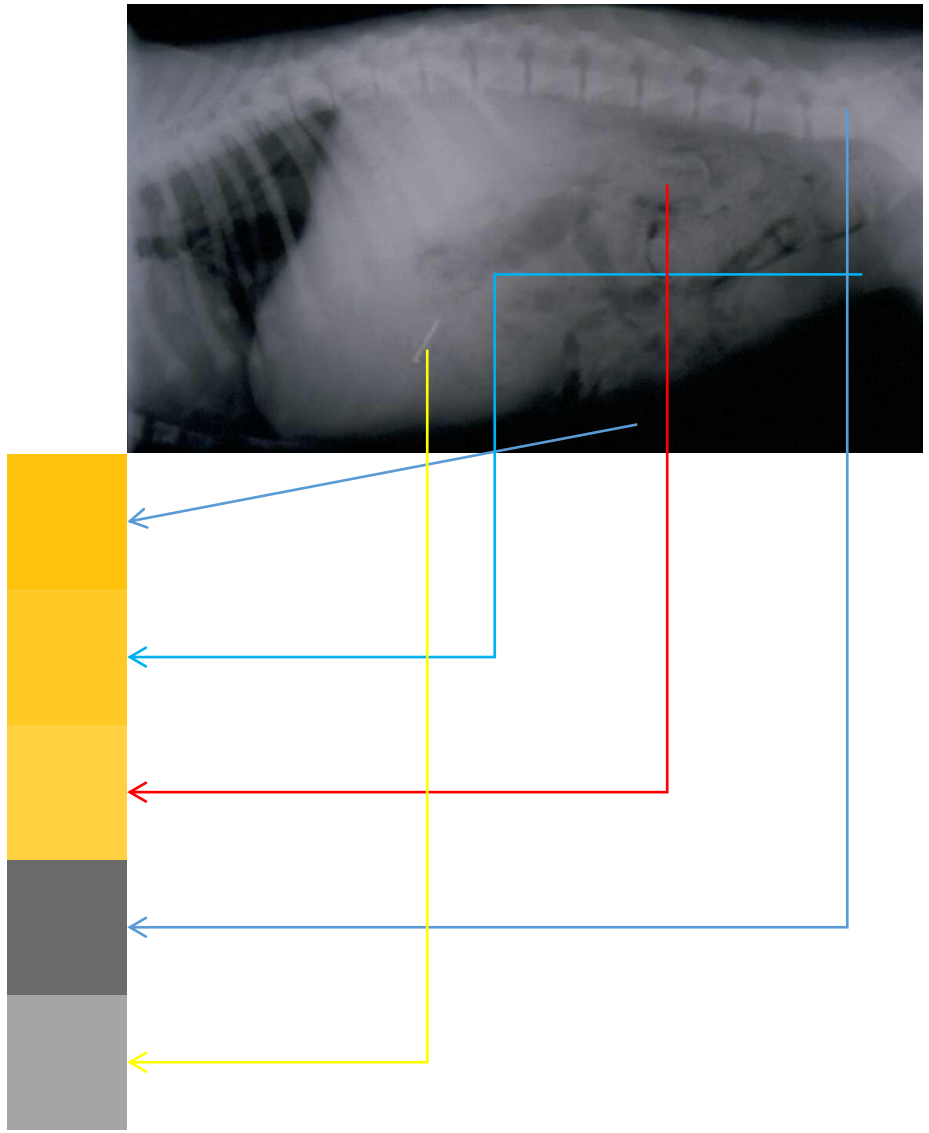
  - External structure and shape of the organ

  - Internal structure and details of the organ examined

  - Changes in radiological intensity of the region are investigated

- There are 5 types of diagnostic radiography;

- Weather - Radiolusent
- Oil
- Water (soft tissue) intermediate density
- Bone (calcification)
- Metal - radiopaque



- No matter how high the X-ray film is, if the physician evaluating it is not an expert, no result can be obtained.

  The basis of the evaluation of the film; is the separation of normal structures from abnormal structures.

  To provide full information from an x-ray film;
  - Good quality film should be taken,
  - The film should be examined in detail,
  - Physician should know the anatomy of the region well,
  - Artifacts formed in the film should be considered,
  - The entire film should be examined in detail and systematically.

The main factors affecting image formation on film are;	patient-related factors	cassette-related factors	dark room factor	type of film used
• Device type and structure Input voltage, Kv factor mA factor Irradiation time Film-focus distance Secondary rays and collimation.	• Anatomical structure of irradiated region, Thickness of irradiated region, Pathological changes, Movement, Object-Focus Distance, Object-movie distance, Position of the object according to the seal (position)	• Type and speed of film Factor factor Grid factor.	• Right or wrong bathroom technology	