

# Nuclear diagnostics and Magnetic Resonance Imaging

## Week 2; Lecture 4; Section 1: SPECT: introduction

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## Section 1

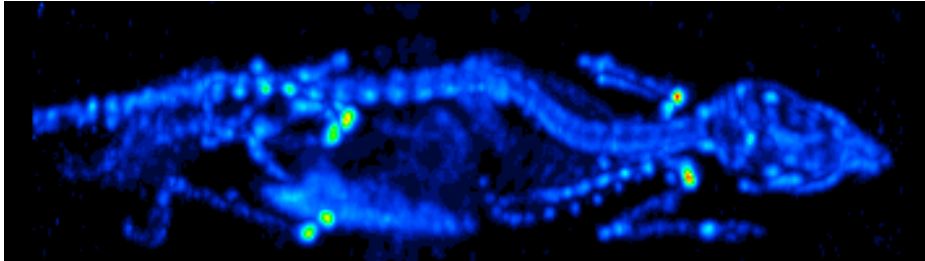
# Introduction

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Gamma camera gives single projected image of object; cf conventional x-ray image

**SPECT**: Single Photon Emission Computed Tomography; cf X-ray CT

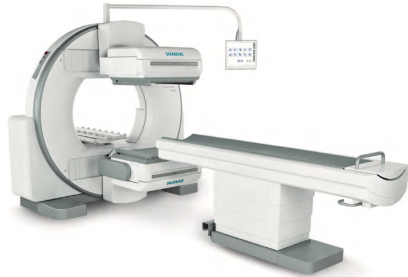
*SPECT image of mouse with bone tracer*



[Click here for C. Lackas' animated gif on wikipedia](#)

Image prepared by C. Lackas

# Typical SPECT systems



Two (or more) gantry-mounted gamma cameras:

- Gamma cameras rotate around patient; 2D cross section
- Images taken from multiple angles
- Bed moves in longitudinal direction

Allows 3D images to be reconstructed

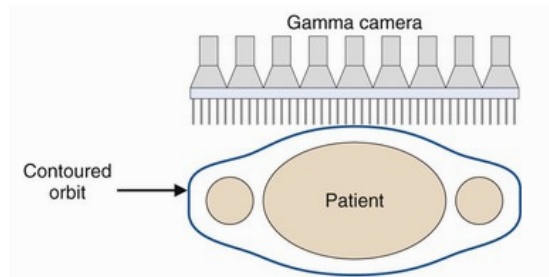
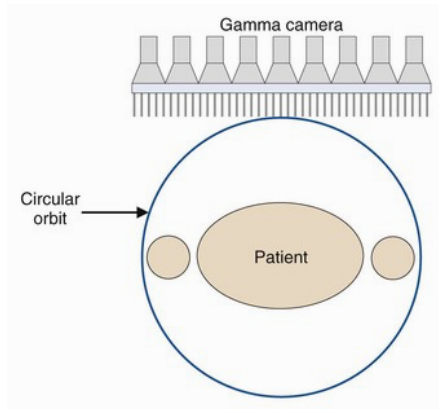


Ring of planar or pinhole gamma cameras

- 2D images obtained without rotation of detectors
- Images taken from multiple angles at the same time
- Bed moves in longitudinal direction

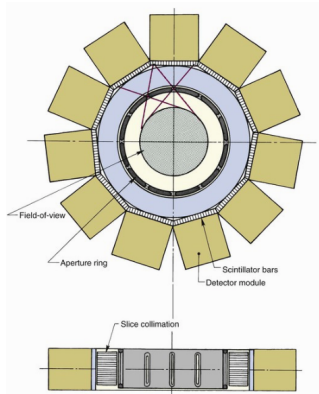
Allows 3D images to be reconstructed

# Circular and contoured orbits

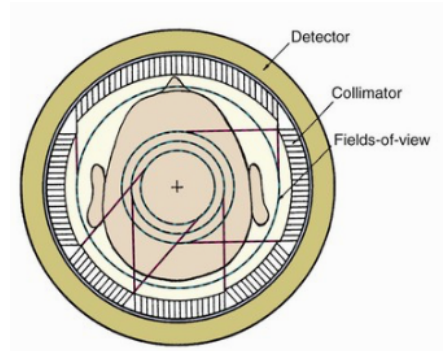


“Elliptical” orbit is more complicated but has the advantage of increased precision

# Alternative configurations, in this case for brain scans



Aperture ring (12 slits) rotates



Each collimator section has its own field-of-view diameter

# Typical parameters

- 64 to 128 angular views
- 2-3 mm linear sampling along longitudinal axis
- 360° data collection
- Reconstructed on  $64 \times 64$  or  $128 \times 128$  matrix
- Field of view  $\sim 40\text{--}60$  cm transaxially
- Stack of images covering  $\sim 30\text{--}40$  cm longitudinally

# Summary of section 1

SPECT exploits gamma-camera technology to generate 3D CT image

System either exploit two, conjugate gantry-mounted gamma cameras or a ring of gamma cameras