other examination.

## CONCLUSION

The ECAT is a complete positron imaging system capable of providing high contrast, high resolution, quantitative images in both a 2 dimensional and tomographic format. The flexibility of this system in its various image mode options allows it to be used for a wide variety of imaging problems.

The geometric and physical design of the ECAT inherently provides for high image quality. Geometric discrimination against coincidence from scattered radiation is accomplished by using relatively large detector bank separation distanced (100 cm) and well designed single plane slit shields which reduce detection of radiation originating outside the plane of interest. The detection ratio of scattered to unscattered coincidence is inversely proportional to the square of the distance between detectors (ie, doubling d reduces scatter fraction by 4). Increasing d also reduces the true coincidence efficiency per detector pair by $d^2$. However, as d increases more detectors can be added and since the detection efficiency in annihilation coincidence detection increases as the square of the number of detectors (8) this completely offsets the reduction in efficiency for each detector. Therefore, the large detector separation distance reduces the scatter fraction without any loss of system detection efficiency. Since the scatter fraction is also directly proportional to the 3rd power of the opening in the slit shields (23) this design aspect of the ECAT further reduces the scatter fraction.

The relatively large value of d also provides better uniformity of resolution with depth (8-11).

Since the random coincidence fraction is also inversely proportional to $d^2$, the ECAT design exhibits a low occurrence of random coincidences. The slit shields and detector shielding dramatically reduces random coincidences by