What is breast CT?

- Similar concept as conventional body CT, except that it is designed to limit the x-ray beam to the breast being imaged.
- In typical geometry:
  - Subject lies prone on the table with the breast to imaged pendant through an aperture
  - Several hundred low-dose projections are acquired by the source-detector assembly
  - Reconstruct projection dataset along coronal planes
Dedicated Breast CT: 1970's

- Almost on the heels of the invention of CT itself, two systems were built by GE
  - Mayo clinic, and
  - University of Kansas Med Center

- System used:
  - 127 Xe detectors
  - 127 x 127 reconstruction
  - 1.56 x 1.56 x 10 mm
  - CT#: -127 to 128

In the study by Chang et al. [Cancer 46:939-946, 1980]:

- 1625 patients underwent breast CT imaging between October 1, 1976 and July 31, 1979
- There were 78 histology-verified cancers
- IV contrast administration
- The cancer detection rate was 94% with dedicated breast CT vs. 77% for mammography

- Continues to be the largest study
Breast Imaging with Body CT: 1980's

- Two studies – both using IV administration of contrast media
  - Chang, et al., AJR 138: 553-8, 1982
    - GE CT/T 8800
    - 120 kV; 80 mA; 4.8 s/rot
    - Experience from 67 patients
    - 17 cancers in the cohort
    - CT detected 16/17 cancers (94%) vs. 12/17 cancers (71%) by mammography
  - Muller et al., JCAT 7:650-4, 1983
    - Philips TomoScan 300
    - 188 kV; 180 mA; 4.8 s/rot
    - All patients had lesions identified on mammography
    - CT identified 32/34 lesions
    - 2 calcified lesions missed by CT

Surgical breast specimens with body CT: 1990's

- Non contrast study comparing body CT (GE Advantage 9800) with high-resolution x-ray specimen radiography
- 44 surgical biopsy specimens
- Fatty specimens: CT = specimen radiograph for masses
- Dense specimens: CT ≠ specimen radiograph for masses
- Microcalcifications: CT < than specimen radiograph

Radiation dose and Feasibility: 2001

- Reported on average glandular dose (AGD) estimates for dedicated breast CT
- Showed the potential of breast CT at radiation dose comparable to two-view mammography

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## Ongoing Research (Partial list)

### Clinical prototypes
- University of California, Davis
- Univ. of Rochester Medical Center
- Radboud University, Nijmegen
- Two systems in China (Tianjin & Guangzhou)
- UMass Medical School
- Institute of Medical Physics, Erlangen
- Duke University

### Bench-top systems (specimen/phantom imaging)
- University of California, Irvine
- US FDA
- M.D. Anderson Cancer Center
- INFN (Napoli, Bologna, Pisa, Trieste)