

X-ray Phase Contrast Imaging

a 3-min talk by Luigi Rigon (rigon@ts.infn.it) Dept. of Physics - UniTS & INFN - Trieste

1895



- Roentgen's discovery (1895) has been **immediately** translated to clinics:
 - [three weeks later it was] “used successfully by European surgeons in locating bullets and other foreign substances in human hands, arms and legs and in diagnosing diseases of the **bones** in various parts of the body”.*The New York Sun*

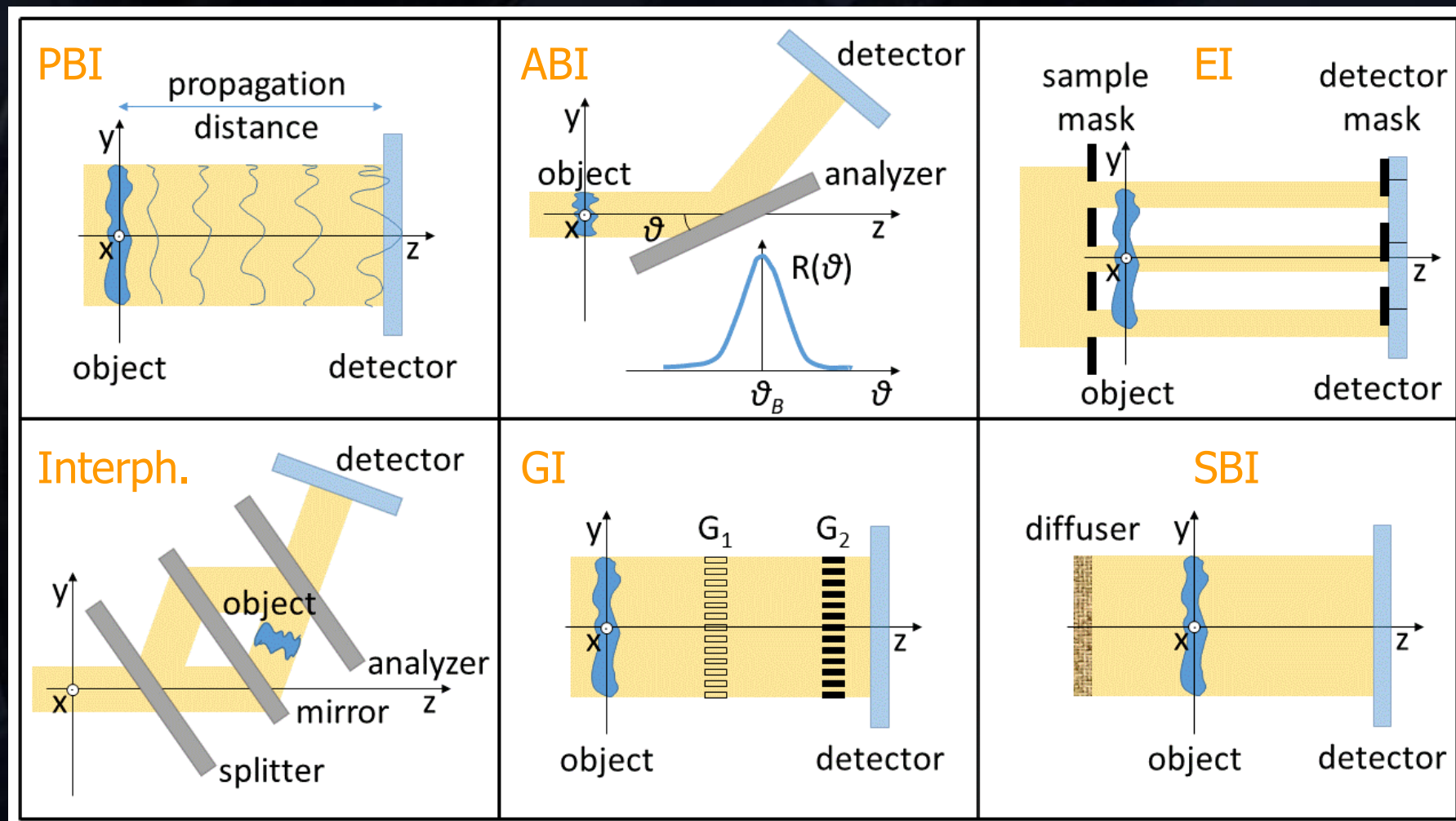
- Nowadays:
 - image quality has much improved
 - radiation dose has been substantially reduced
 - but the physical principle remains the same, namely **X-rays absorption**

Today

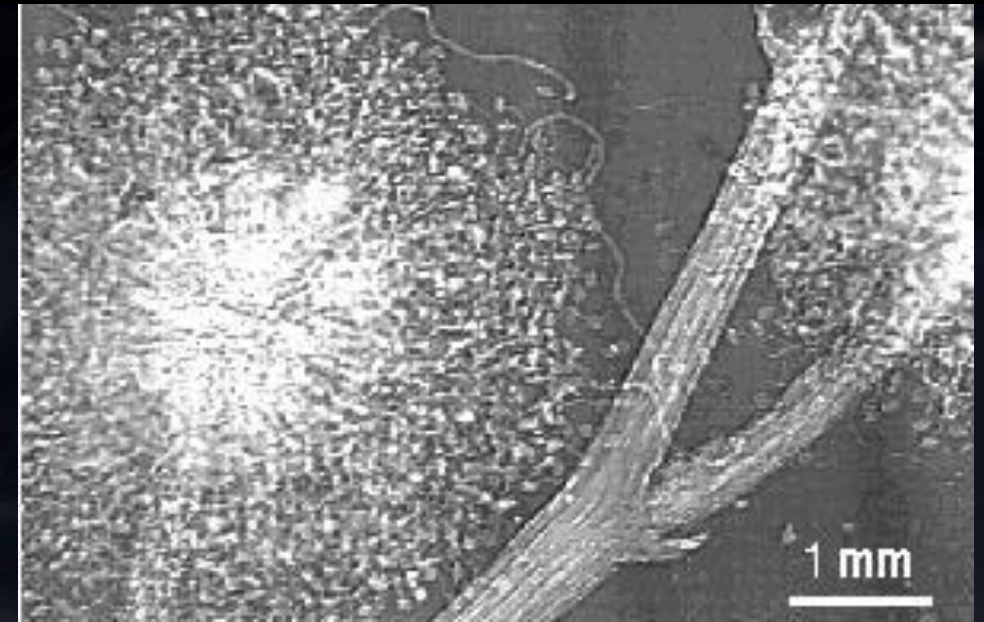


However, **X-rays are electromagnetic waves**, and “there is hardly a phenomenon in the realm of light whose parallel is not found in the realm of X-rays” [Compton, Nobel Lecture, 1927]

- Since **X-rays are waves**, we can perform X-rays **Phase Contrast Imaging**:
 - the underpinning physical principle is the **phase shift** of the X-ray wave
 - some **phase-sensitive techniques** are needed: they have been developed since 1995, mostly at **synchrotron facilities** (such as Elettra)
 - **higher quality** images can be obtained at the **same (or lower)** radiation doses
 - some techniques do not need a **coherent X-ray source**, and could be soon (?) **translated into clinics**
 - several applications can be envisaged, not only in medical imaging



Mimosa flower: conventional (absorption) Vs phase contrast image (Trieste, 1997)



- X-ray Phase Contrast imaging is an **hot topic** attracting several researchers from all around the world
- Trieste is **one of the best places in the world** to carry out research in X-ray Phase Contrast imaging:
Tu et al., J Med Radiat Sci 00 (2021) 1–10
 - UniTS (Renata Longo, Pierre Thibault, Fulvia Arfelli)
 - Elettra (Giuliana Tromba, Diego Dreossi, Lucia Mancini)
 - INFN (Luca Brombal @PEPI Lab)

