

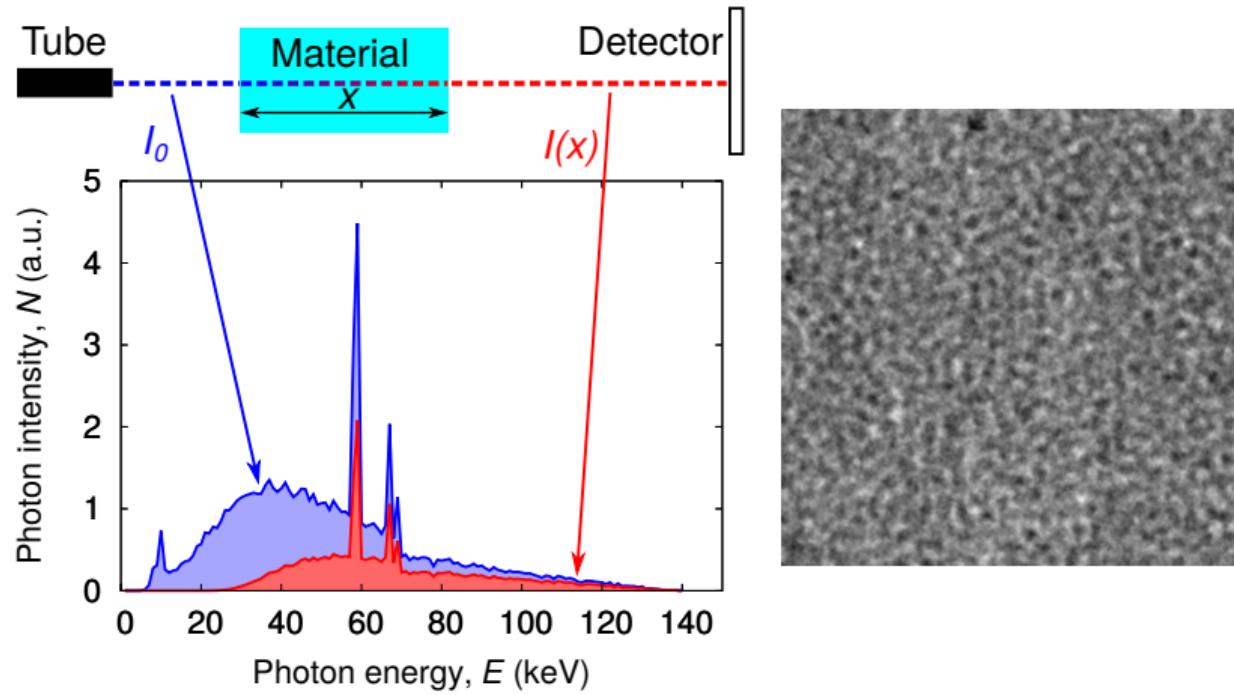


PhD defense  
**Manuel Baur**

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1653

# X-ray radiography of granular systems – particle densities and dynamics



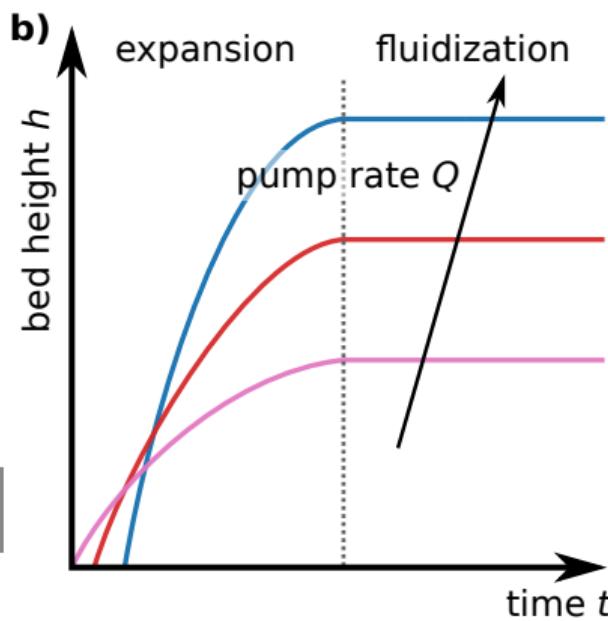
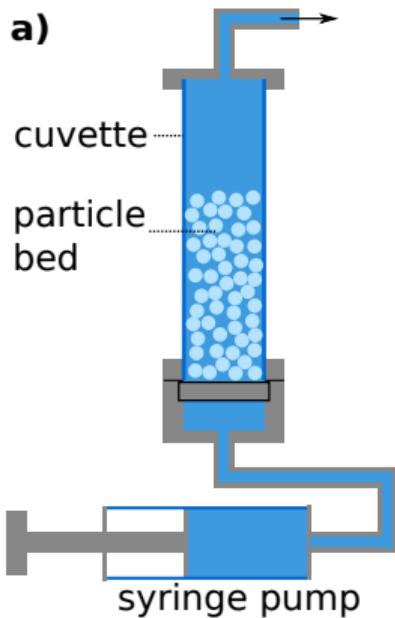
## Example Fluidized bed reactor

Wikipedia: Disadvantage: Lack of understanding: "It is very difficult to predict and calculate the complex mass and heat flows within the bed."

Particle dynamics ↔ densities

1. Motivate physical system of granular flow (nice challenge to study)
2. Motivate technique of radiography

# X-ray radiography of granular systems – particle densities and dynamics

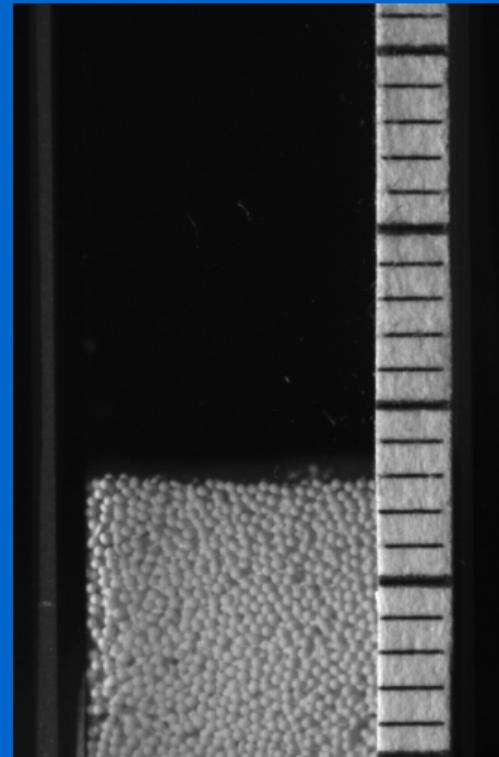
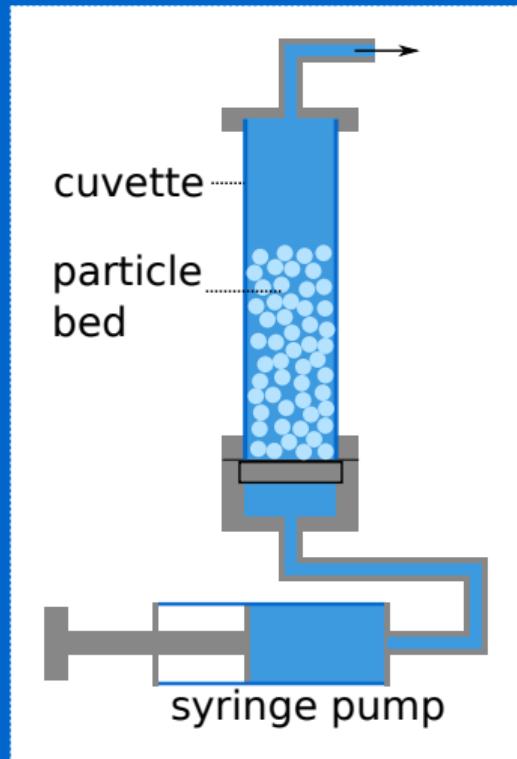


Industrial application:  
Fluidized bed reactor

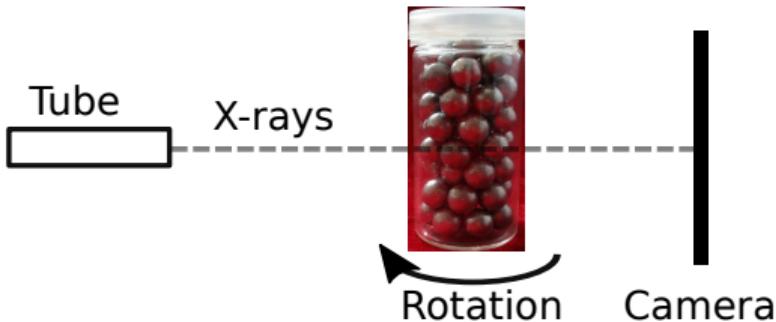
## "Lack of understanding:

It is very difficult to predict and calculate the **complex mass** [...] flows within the bed."

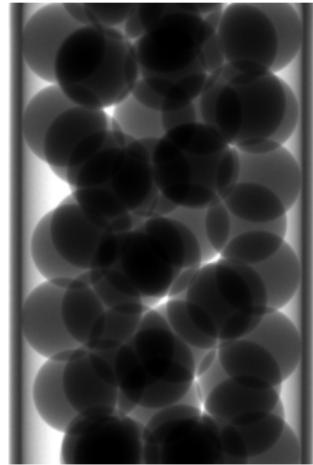
# Particulate flows are **opaque**



# X-ray radiography

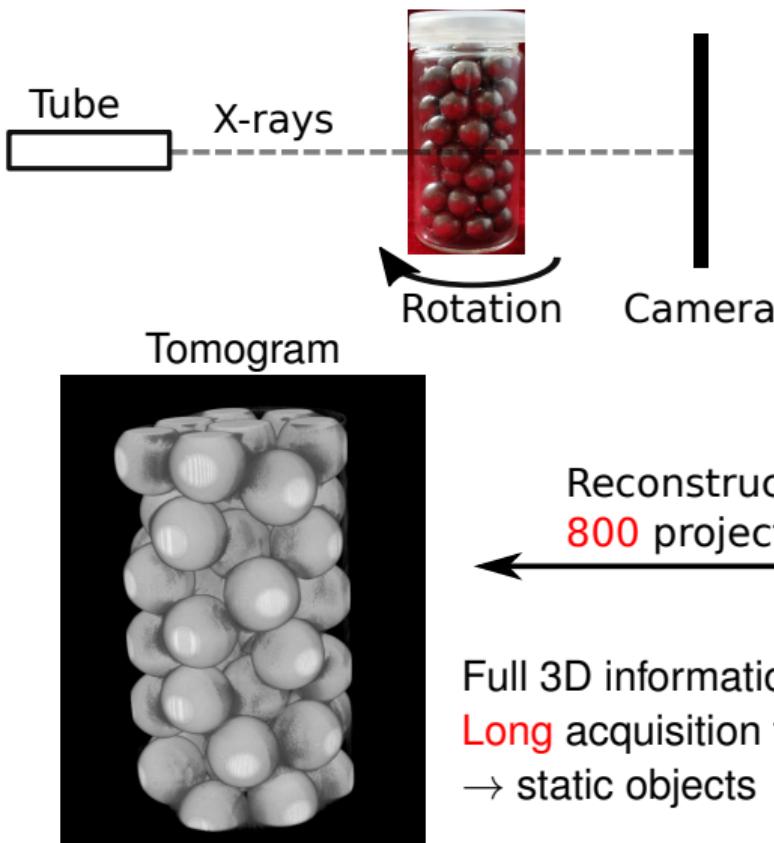


Radiogram



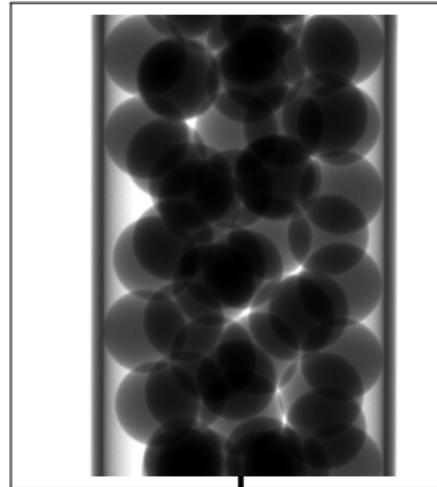
2D projections of 3D object  
Short acquisition time

# X-ray radiography

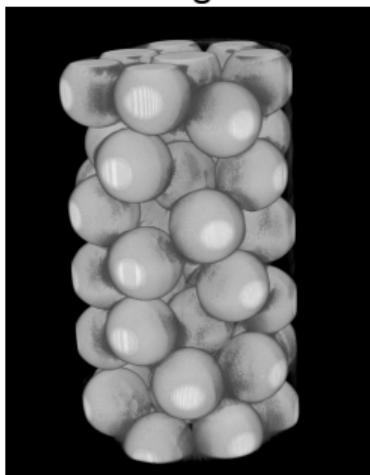


Radiogram

2D projections of 3D object  
Short acquisition time



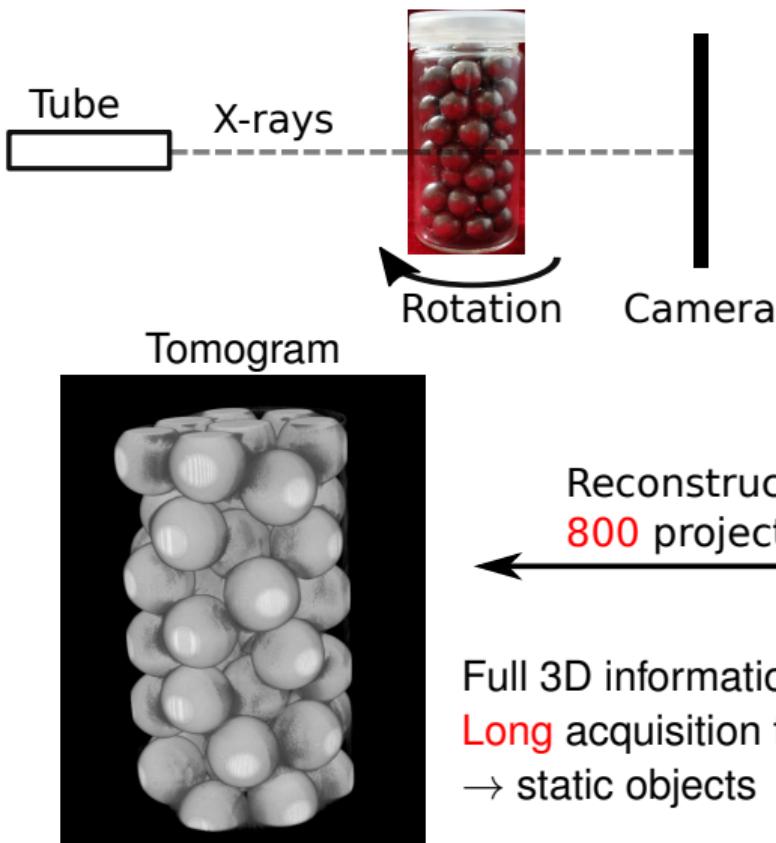
Tomogram



Reconstruction from  
800 projections

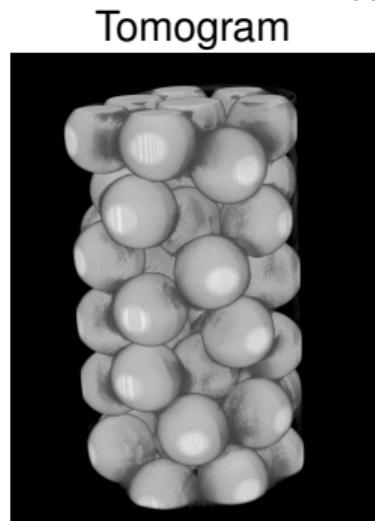
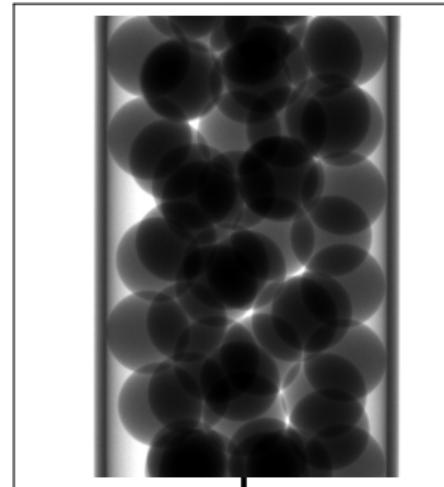
Full 3D information  
Long acquisition time  
→ static objects

# X-ray radiography



Radiogram

2D projections of 3D object  
Short acquisition time



Tomogram

Full 3D information  
Long acquisition time  
→ static objects

Reconstruction from  
800 projections

Dynamic system

