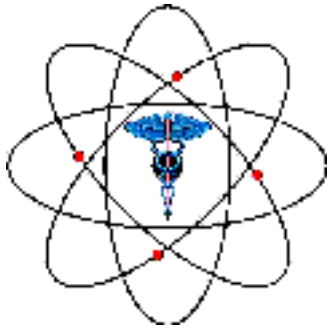

# Simulating PET data with STIR

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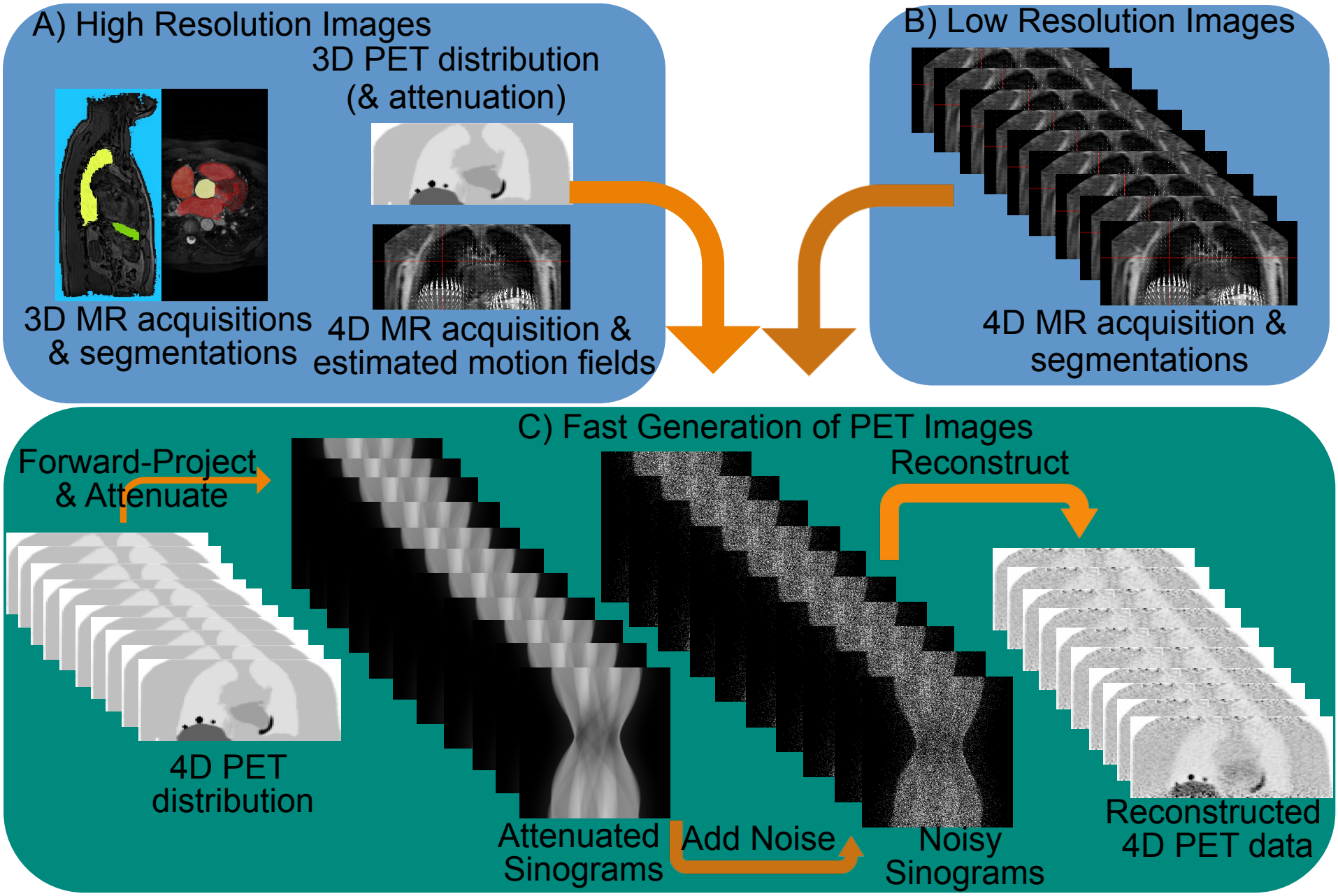
King's College London

# Fast Analytic Simulations




Tsoumpas *et al* 2011 PMB

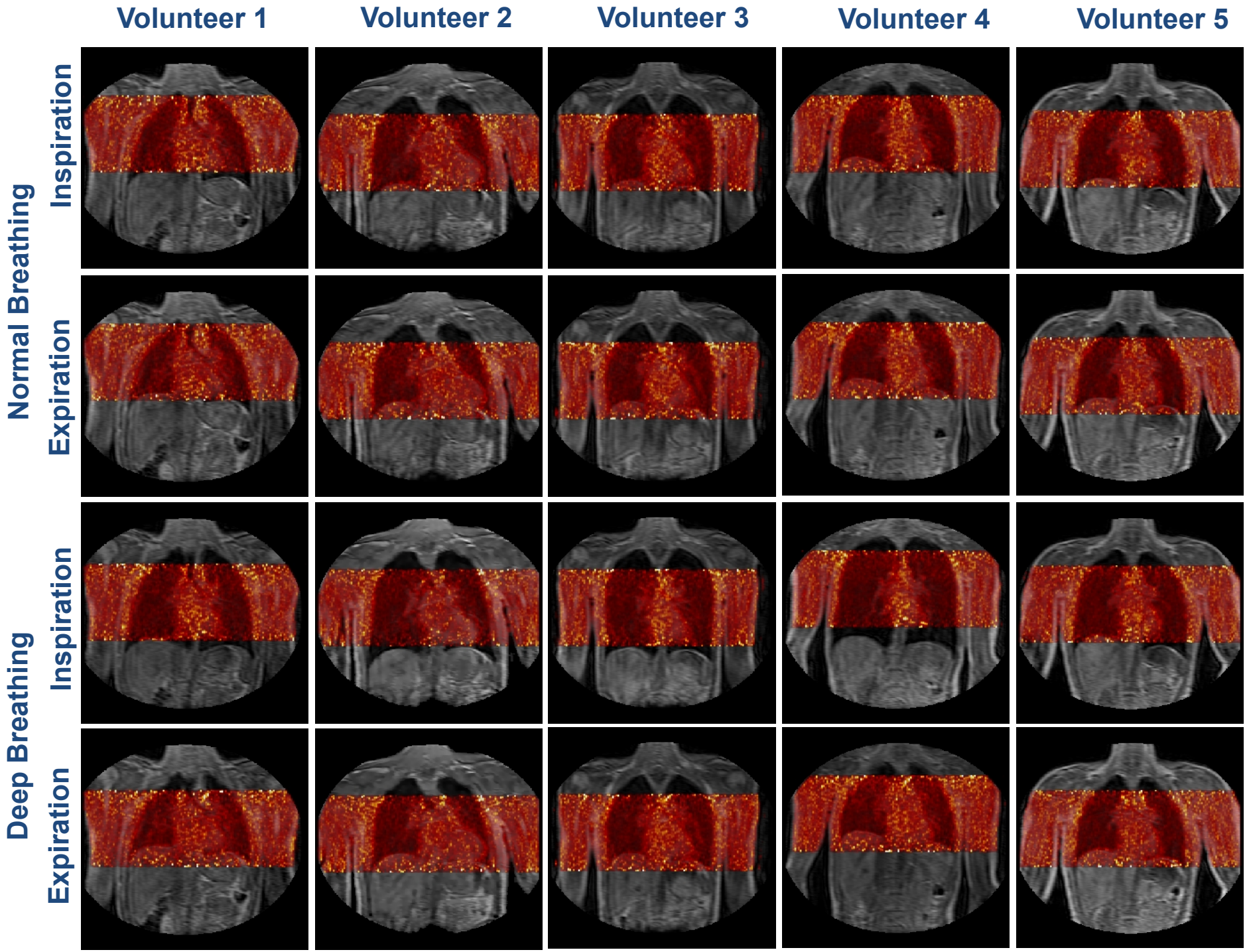
# Step by step simulation examples

- Include your scanner in **`Scanner.cxx`** `(.h)`
- **`create_projdata_template`**
- **`fwdtest`**
- **`estimate_scatter`**
- **`stir_math`** `-s total scatter.hs unscattered.hs`
- **`poisson_noise`** `-p total_10E9 total 0.1 124`
- **`OSMAPOSL`** `OSEM.par` / **`FBP3DRP`** `FBP.par`

# How To: Simulate Scatter

STEP 1: `estimate_scatter scatter.par`

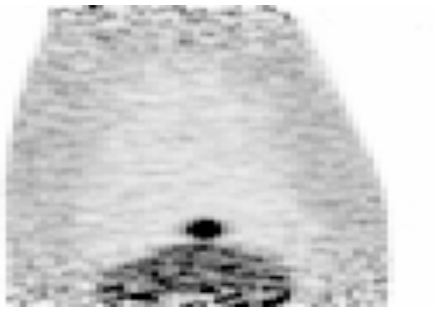
```
attenuation_threshold :=.01
random :=0
use_cache :=1
energy_resolution :=.22
lower_energy_threshold :=350
upper_energy_threshold :=650

activity_image_filename := ${ACTIVITY_IMAGE}
density_image_filename := ${DENSITY_IMAGE}
density_image_for_scatter_points_filename:=${LOW_RES_DENSITY_IMAGE}
template_proj_data_filename :=  ${TEMPLATE}

output_filename_prefix :=${OUTPUT_PREFIX}


End Scatter Estimation Parameters:=
```

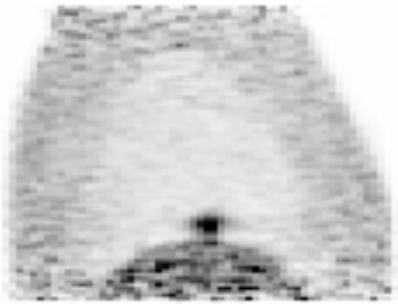

Volunteer 1
Volunteer 2
Volunteer 3
Volunteer 4
Volunteer 5
Normal Breathing
Inspiration
Expiration
Deep Breathing
Inspiration
Expiration

# Visual Comparison

FAST

GATE





# Remarks

- Simulation realism and image quality are adequate for several investigations e.g. on motion correction

- The computational speed up can be as high as 1500x (for 1 position) comparing to GATE simulations but 70000x for each realization

- No claim that analytic simulations can replace Monte Carlo accuracy

- Realistic PET-MR data can be simulated based on real MR