

# Current status of my research

Naoto Hasegawa

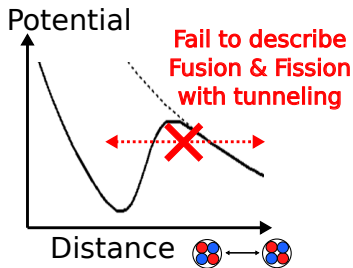
Nuclear theory group, D1

October 10, 2019



## Goal

### Microscopic description of many-body tunneling



⇒

Mean-field approximation

$$\Phi = \mathcal{A} [\phi_i(x_1) \phi_j(x_2) \cdots \phi_n(x_A)]$$

↓

Beyond mean-field  
(Superposition of  $\Phi$ )

$$\Psi = \int da f_a \Phi_a$$

## Example

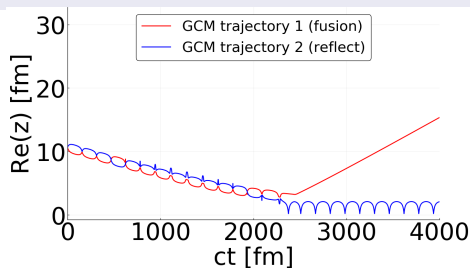
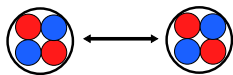
- Sub-barrier fusion : Fusion in stars
- Fission & Microscopic : Fission in neutron rich region and superheavy region (difficult to experiment)

# Current work

## Step1

Construct new theory with many-body tunneling in simple model.

- 1 Dimensional
  - Many restrictions (only few nucleons, spin fixed, ...)
- (Paper is in progress)



# Future work

## Step2 (Now)

Remove restrictions to include physical properties.  
(1 dimensional)

- internal excitation
- weakly bound state
- ...

## Goal of my Doctor course

Extend to realistic case (3 dimensional)  
and **apply to the region where experiment is difficult**

## Master course

- Orsay in France: September 15-26, 2018  
Discussed with Denis Lacroix, David Regnier, ...

## In Doctor course

- YITP in Kyoto: October 26-November 8, 2019  
Attend to Nuclear Fission Dynamics 2019  
(Oral presentation)
- Discussion with David Regnier again (Contact is not yet)