



# **GP-PU PROGRESS REPORT**

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PH.D 2ND YEAR  
NUCLEAR THEORY GROUP  
B8SD2010**

**REQUIRED CREDITS**

**INTERNATIONAL EXPERIENCE**

**RESEARCH PROGRESS**

# REQUIRED CREDITS

- Advanced Lecture on Physics for the Universe I  
⇒ ✓ GSP 18 (as of May 7, 2019)
  
- Advanced Lecture on Physics for the Universe II  
⇒ ✓ GASP 10 (as of May 7, 2019)
  
- Advanced International Training on Physics for the Universe  
⇒ 2 weeks (Orsay, France) + 5 days (Hawaii, U.S.)

# INTERNATIONAL EXPERIENCE



- **Hawaii Joint Meeting (Hawaii)**



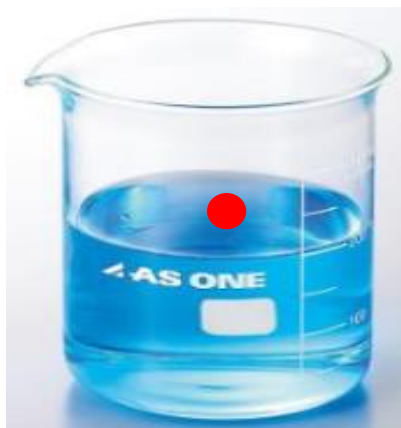
- **NN2018 (Omiya)**

Discussions with Alexis Diaz-Torres, Aurel Bulgac, Students from Australia and India

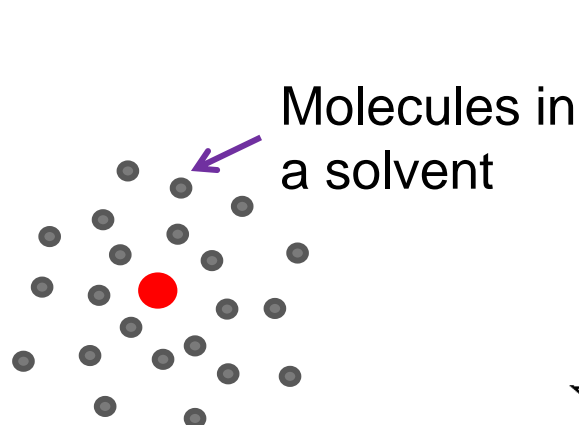
# RESEARCH PROGRESS

## Open quantum systems

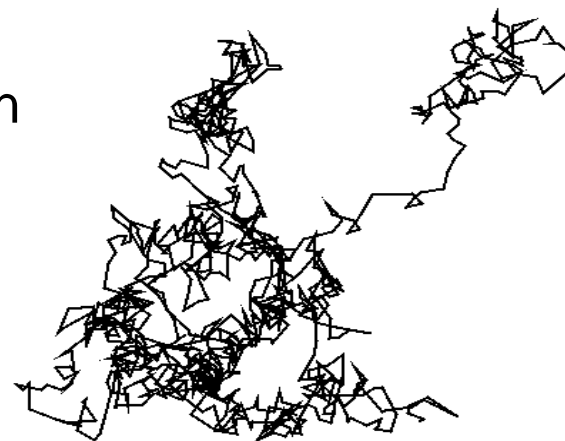
Example: **Brownian motion**



Setup



Illustration

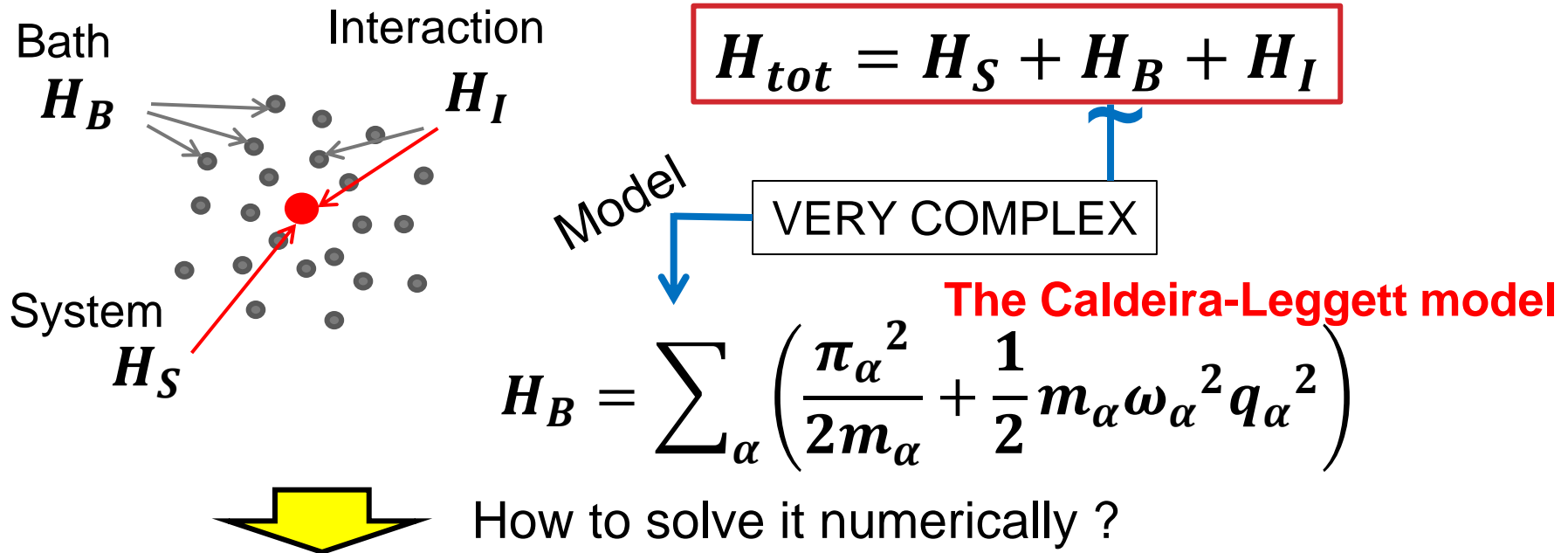


Trajectory

**Quantum mechanical  
Brownian motion ?**

# RESEARCH PROGRESS

## System + bath approach




## Attempts (Discussions with Dr. Denis Lacroix)

- ✓ **Quantum Monte Carlo method**
  - ➡ Bad convergence. Instability.
- ✓ **Perturbation expansion method**
  - ➡ Heavy at high orders

# RESEARCH PROGRESS

## New Attempt

✓ **Master equation method**  Heavy at high dimensions



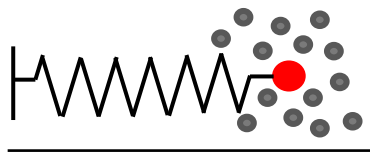
Introducing an approximation

### ● Reducing calculation cost

Previous work ... spin-1/2 systems

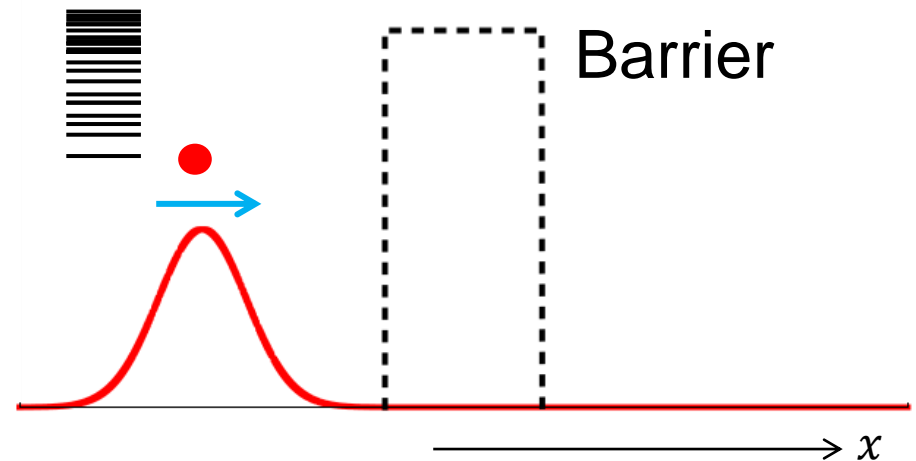
$\uparrow$  or  $\downarrow$  :  $N = 2$

This time ... 1D damped HO

 :  $N = 220$

### ● Barrier transmission problems

Energy levels (environment)



## This semester

- Writing papers about above works
- Attending nuclear school in China in August (?)