

# APCTP SEMINAR

## How Many is Different? - Question of Emergence and Answer from Ideal Bose Gas"

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**October 26th (Tue.) 16:00 (KST)**

Online via **ZOOM**

How many H<sub>2</sub>O molecules are needed to form water? While the precise answer is not known, it is clear that the answer should be a finite number rather than infinity. We revisit with care the ideal Bose gas confined in a cubic box which is a standard textbook system. What the textbooks don't tell you is that the isobar of the ideal gas zigzags on the temperature-volume plane featuring a 'boiling-like' discrete phase transition, provided the number of particles is equal to or greater than a particular value: 7616 (canonical ensemble, exact result). This critical number can be viewed as the quantum characteristic of 'cube' or Jacobi theta function. We discuss the finite effect of Avogadro number and applications to interacting real molecules. Liquid-gas phase transitions may occur essentially due to the identical nature of particles.

### ■ **ZOOM Webinar**

- 1) Please register through this ZOOM link  
<https://us06web.zoom.us/joining/register/tZMsde6oqzlsGNHGjbaQO-cMCRk2gzl6A60>
- 2) Join the webinar with a link generated after the registration
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