Quantum Mechanical Concept of Entropy

Advanced

- As we have seen in the basic module, all kinds of definitions for the entropy are equivalent as long as some undetermined constant is allowed. Using quantum theory however, an absolute definition of the entropy, or an absolute zero point for entropy emerges.
- Without going into details, what happens is:
  - The "phase space volume" definition for ***P*** is the most general choice. Since we have to have a pure number in the **ln**, the volume that the system under consideration occupies in phase space must be divided by an appropriate elementary unit of phase space. In classical physics, there is no way of uniquely defining that unit; you are left with the ambiguity as discussed above.
  - Quantum theory, however, leaves only *one* choice for the elementary unit Π_0 of phase space volume for a system with ***N*** particles:

$$\Pi_0 = h^{3N}$$

  - With **h =** Plancks constant.
- Entropy, it turns out, is a well defined quantity after all. But again, for most applications, especially concerning defects, you do not have to worry about the finer points highlighted here.