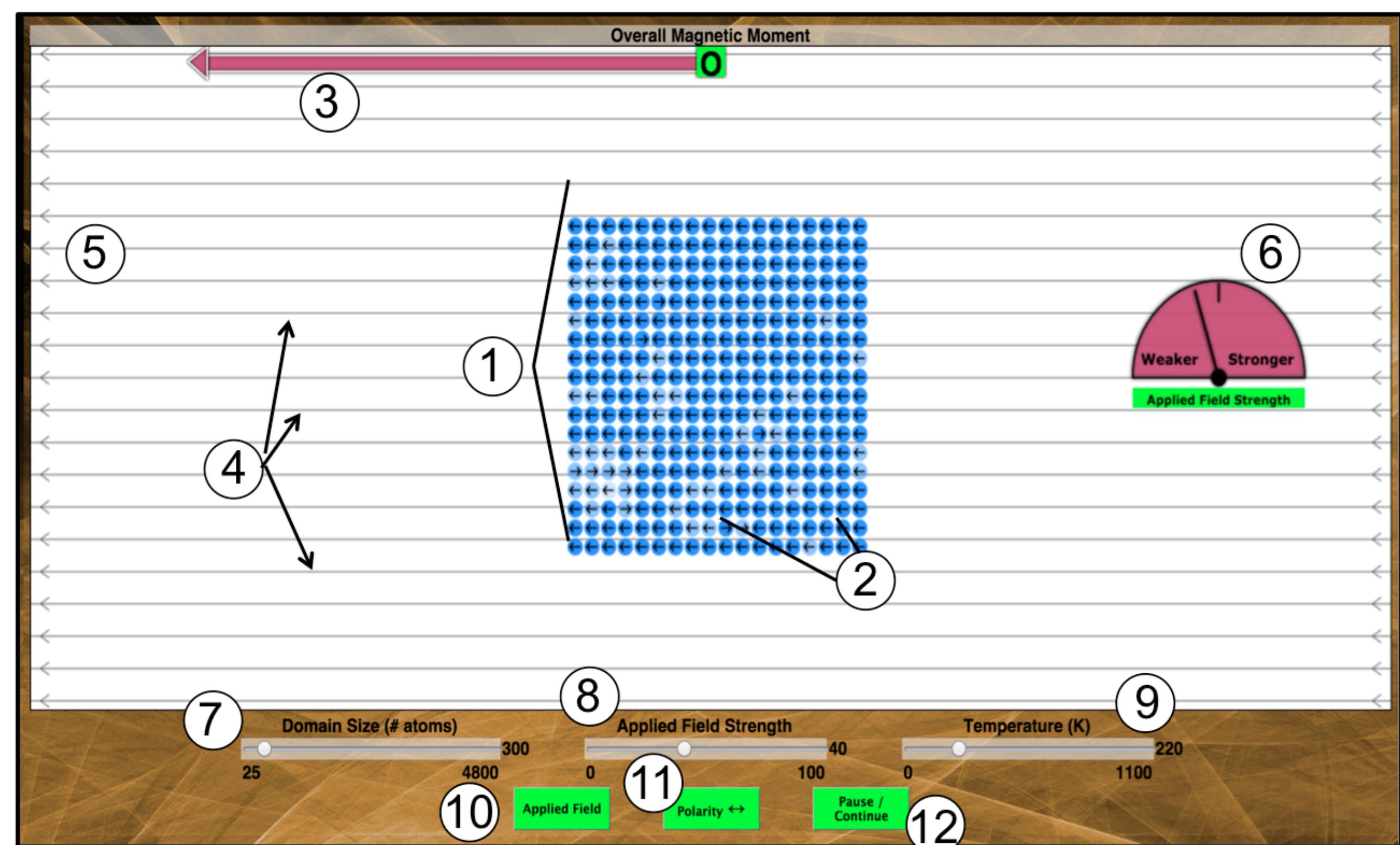


Simulating Nanoscale Magnetism in a Single Domain

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The Interface



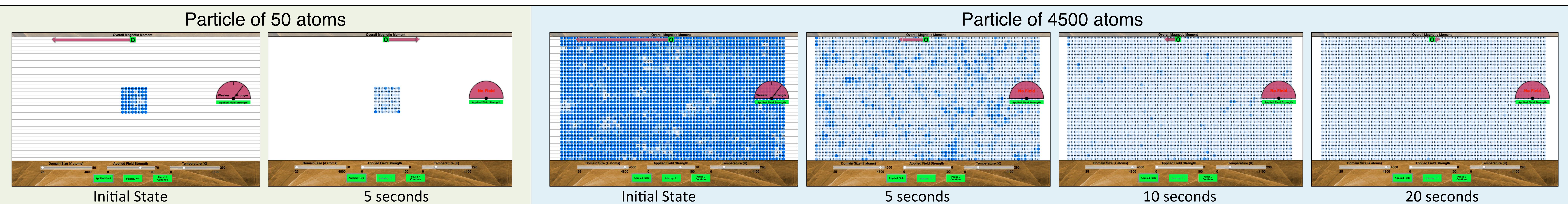
1. Magnetic domain (piece of iron).
2. Atoms in the domain (iron atoms).
3. Magnetic moment indicator (overall).
4. Field lines.
5. Direction of polarity (N/S).
6. Field strength indicator.
7. Size of the domain (# of atoms) (A/S).
8. Strength of applied field. (G/H).
9. Temperature (thermal energy), (K/L).
10. Applied field (On/Off).
11. Polarity (direction of applied field).
12. Play / pause.

Concepts Investigated

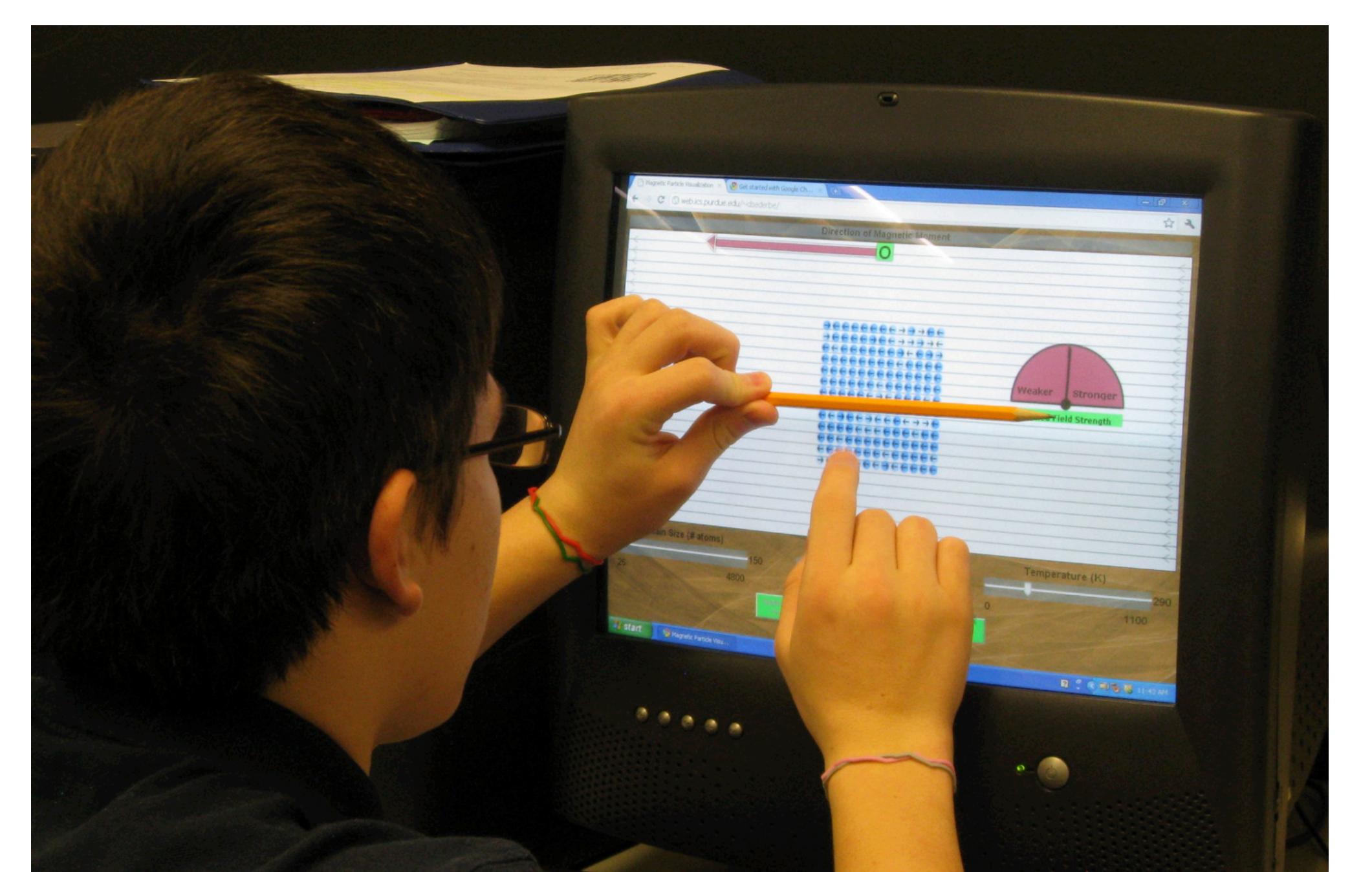
Guided inquiry helps students understand:

- Why nano particles do not stay magnetized
- Magnetism is a size-dependent property
- The Curie temperature of a material
- The particle nature of matter
- Magnetic moments
- Magnetic fields and forces
- Thermal energy
- What it means to “be magnetized”
- Surface to volume relationships

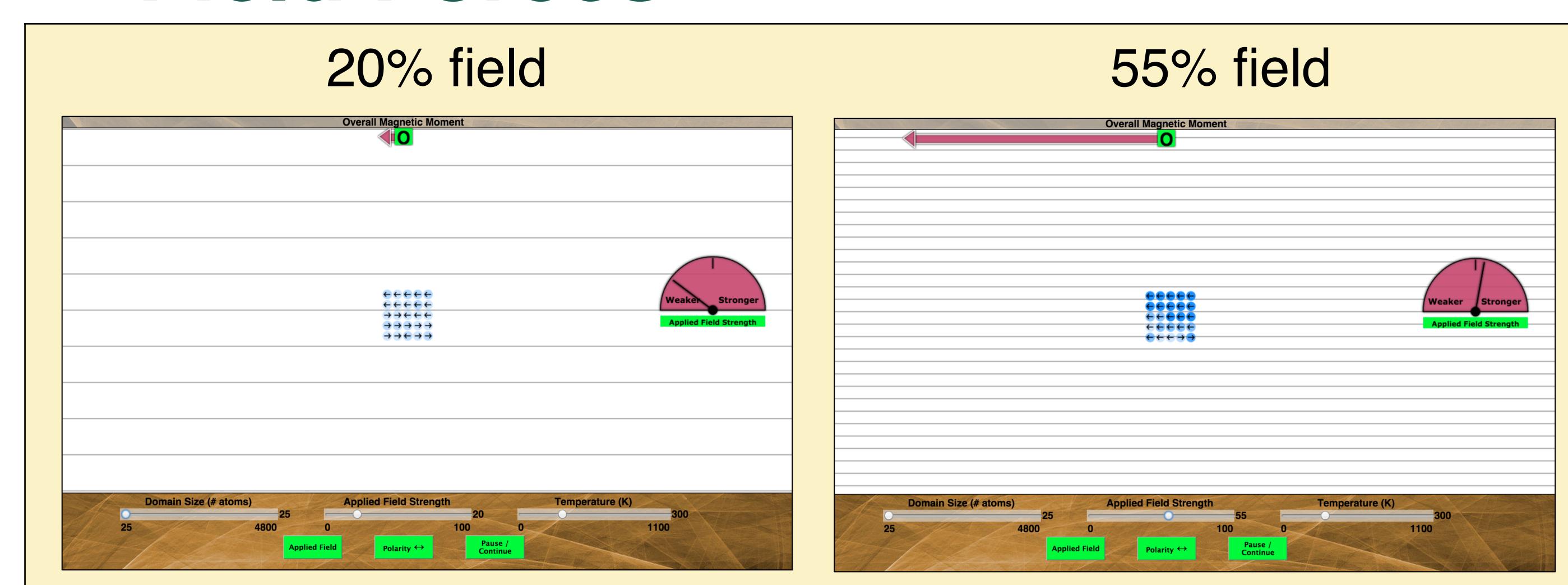
➤ Remanence versus Size



➤ Remanence versus Temperature (Curie Point)



➤ Field Forces



Learning Goals

Atoms are magnetic in nature

Being magnetized is the result of the alignment (superposition) of individual magnetic moments

Alignment is a dynamic process and can be reversed

Staying magnetized (remanence) is inversely related to thermal energy of the atoms

The smaller the particle, the greater the ratio of surface atoms to those of the total volume

Magnetism is a size dependent property – the smaller the piece, the less remanence