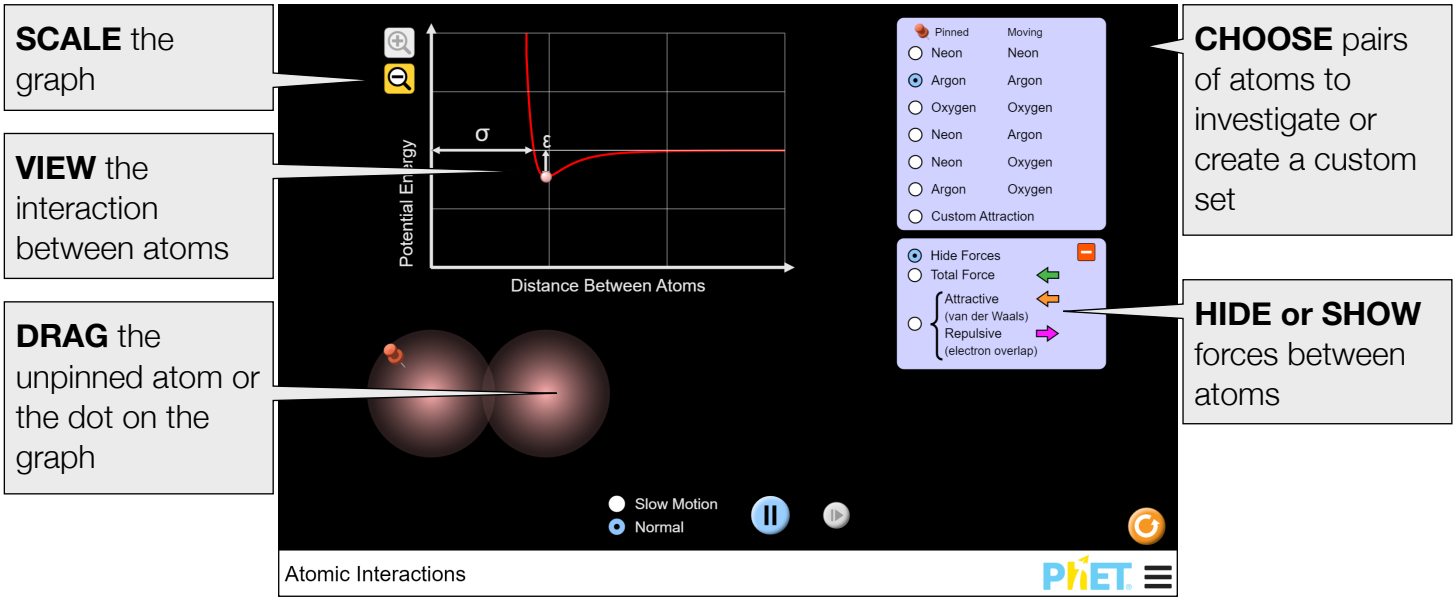
PhET Tips for Teachers

Atomic Interactions

In the ***Atomic Interactions*** simulation, students investigate how the relationship between attractive and repulsive forces govern the interaction between atoms.



Complex Controls

- The background of the simulation can be changed for easier projection by going to the PhET menu bar, selecting Options, and checking Projector mode.

Insights into Student Use

- The force arrows are off by default as students initially found them overwhelming in interviews.
- Student interviews also indicated that students found the force arrows helpful for making sense of the potential energy graph.

Model Simplifications

- The interaction between the two atoms is modeled using the Lennard-Jones potential.
- The atomic radius, which corresponds to σ (sigma), is the Van der Waals radius.
- For the oxygen-oxygen, epsilon (ε) roughly corresponds to the average bond energy. Sigma (σ) was calculated based on the average bond length as the bottom of the potential energy well is located at the equilibrium bond distance.
- The bonding behavior for oxygen-oxygen is not explicitly shown in this simulation, as it would require a third atom to carry off excess energy. However, the well depth and forces between the oxygen atoms are much larger, consistent with a bonding pair.

Rouinfar, August 2023

Customization Options

Query parameters allow for customization of the simulation, and can be added by appending a '`?`' to the sim URL, and separating each query parameter with a '`&`'. The general URL pattern is:
`…html?queryParameter1&queryParameter2&queryParameter3`

For example, in Atomic Interactions, if you want to turn on projector mode (`colorProfile=projector`), with links disabled (`allowLinks=false`) use:
https://phet.colorado.edu/sims/html/atomic-interactions/latest/atomic-interactions_all.html?colorProfile=projector&allowLinks=false

To run this in Spanish (`locale=es`), the URL would become:
https://phet.colorado.edu/sims/html/atomic-interactions/latest/atomic-interactions_all.html?locale=es&colorProfile=projector&allowLinks=false

Query Parameter and Description	Example Links
`locale` - specify the language of the simulation using ISO 639-1 codes. Available locales can be found on the simulation page on the Translations tab. Note: this only works if the simulation URL ends in "_all.html".	`locale=es` (Spanish) `locale=fr` (French)
`colorProfile` - changes simulation colors for easier projection.	`colorProfile=projector`
`allowLinks` - when `false`, disables links that take students to an external URL. Default is `true`.	`allowLinks=false`

Suggestions for Use

Sample Challenge Prompts

- Describe how attractive and repulsive forces influence the attraction between two atoms.
- Explain the relationship between the attractive forces between atoms and the potential energy graph for the atom pair.
- Compare and contrast the behavior and potential energy graph for all atom pairs.
- Describe what would need to happen for oxygen to form a diatomic bond.
- Define the values of σ and ε.

See all published activities for Atomic Interactions here.
For more tips on using PhET sims with your students, see Tips for Using PhET.