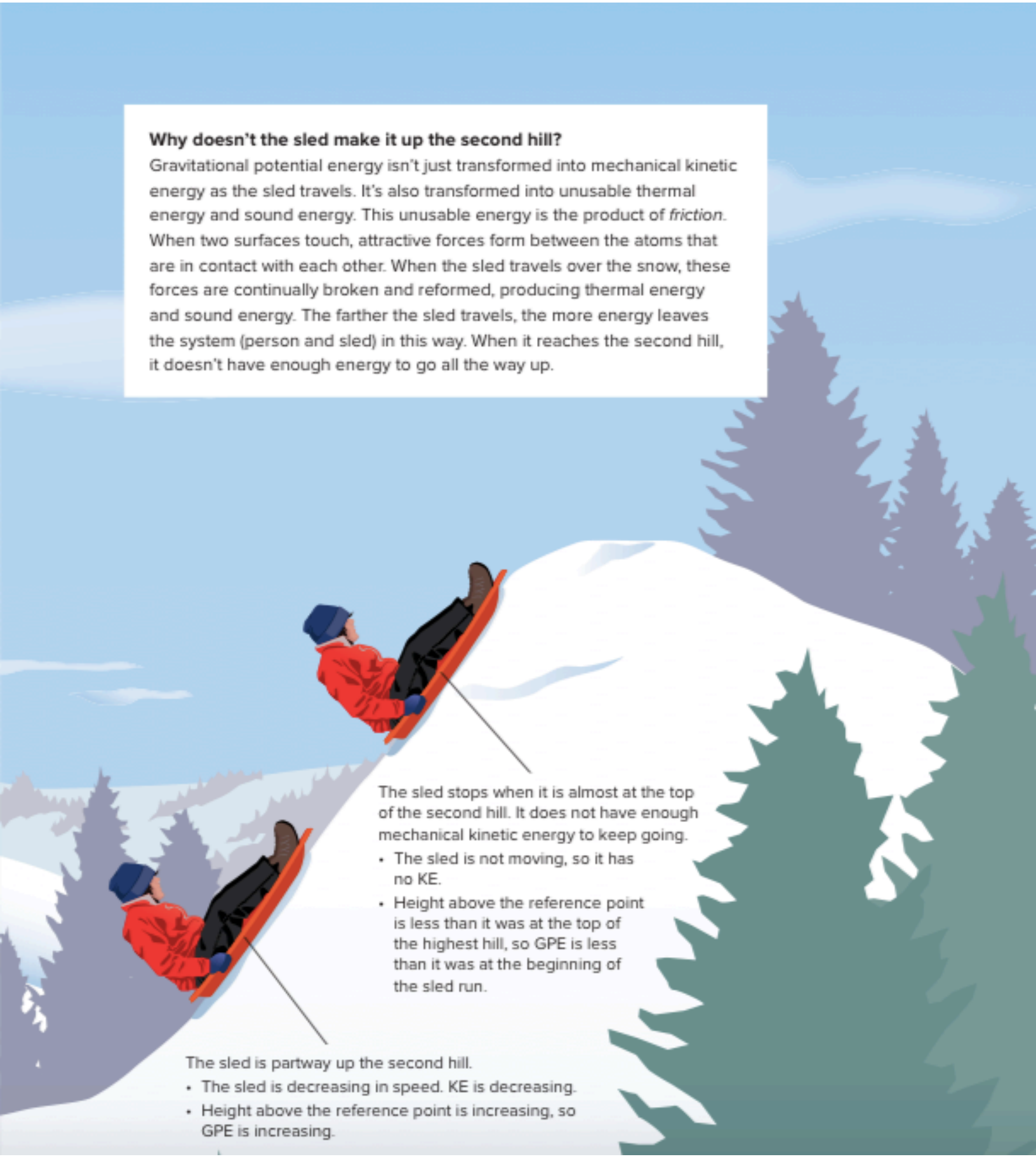
Why doesn't the sled make it up the second hill?

Gravitational potential energy isn't just transformed into mechanical kinetic energy as the sled travels. It's also transformed into unusable thermal energy and sound energy. This unusable energy is the product of *friction*. When two surfaces touch, attractive forces form between the atoms that are in contact with each other. When the sled travels over the snow, these forces are continually broken and reformed, producing thermal energy and sound energy. The farther the sled travels, the more energy leaves the system (person and sled) in this way. When it reaches the second hill, it doesn't have enough energy to go all the way up.



The sled stops when it is almost at the top of the second hill. It does not have enough mechanical kinetic energy to keep going.

- The sled is not moving, so it has no KE.
- Height above the reference point is less than it was at the top of the highest hill, so GPE is less than it was at the beginning of the sled run.

The sled is partway up the second hill.

- The sled is decreasing in speed. KE is decreasing.
- Height above the reference point is increasing, so GPE is increasing.