Molecular Beam Epitaxy!

Scientists can build layers of atoms onto one another using a method called **Molecular Beam Epitaxy (MBE)**. It's name means "building a crystal structure on top of another with streams of molecules or atoms". These atoms and molecules make materials called SEMICONDUCTORS.

Other scientists (like me) take these structures and "process" them. That means we take parts of the top off to reveal the layers underneath in specific patterns. These structures are actually very small and are what you might call "computer chips." We use these chips in all modern technology - computers, cell phones, CD players and calculators.

To do both of these things the environment must be very very clean. Since they work with atoms, even one atom of dirt can get in the way. Scientsts wear over-clothes to keep things from getting dirty.

Objective: Build a simulation of a MBE sample.

Materials: Block shapes

1. Look at model of how atoms and molecules grow on top of a base crystal. See
   how the crystal pattern is continued

2. You are now an "MBE scientist". Make your own MBE structure. Make sure you have layers.

Red: Large	Blue: Medium	Yellow: Medium	Green: Medium	Red: Small	Blue: Small	Yellow: Small
Si	In	Al	As	Sb	Ga	Pb

3. Draw your creation. Count the number of each kind of atom.

4. Now switch structures with a partner. You are now a "processing scientist". They make shapes in the atomic layers like you saw in the microscope. Remove atoms to reveal a shape like a square or letter L in the layers.

5. Draw the result. Count the number each kind of atom.

7. Final step!
The average size of an atom is 1Å. (Å=angstrom=0.1nm or 10^{-10}m).

If the layer I am interested in is 300Å below the surface, how many layers of atoms do I need to go through?_____

This worksheet created by LEAPS graduate Fellow Julie Correa