

# Thermal Energy and Heat

## Matter





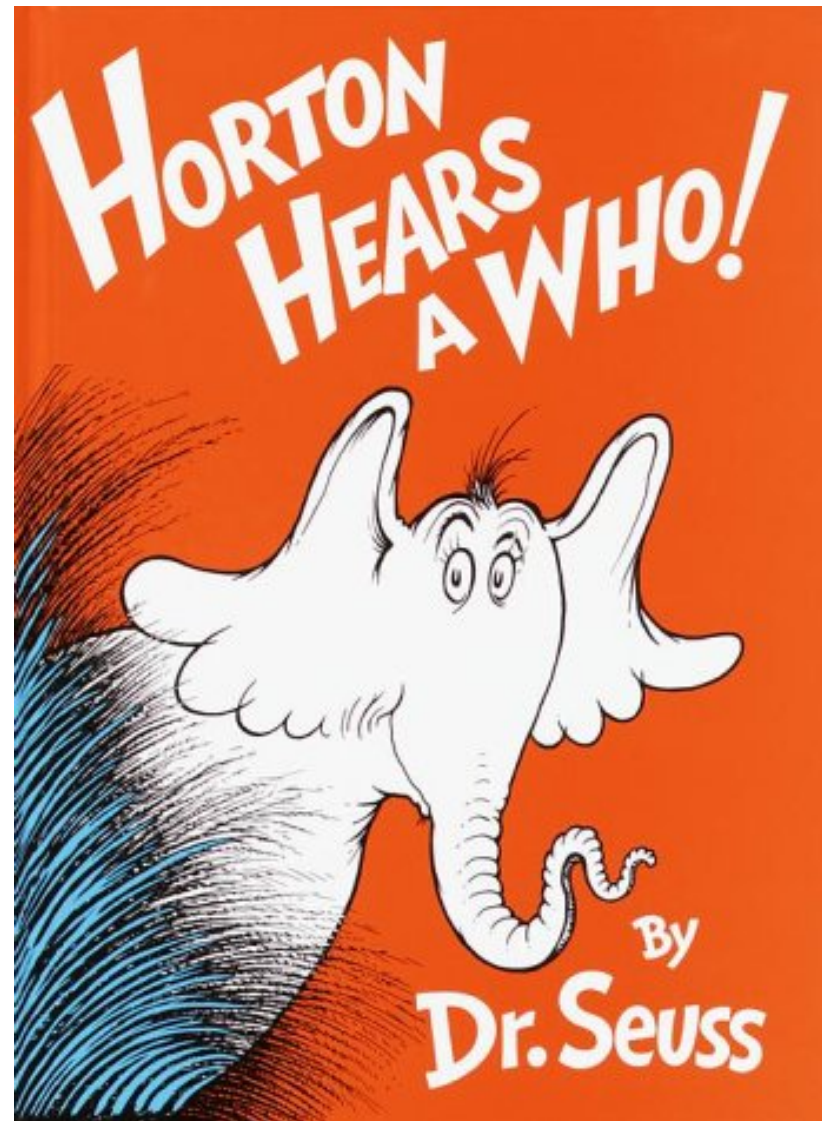
## How Small is Small?

### 3 min Challenge

In groups of threes or fours brainstorm a list of small things.

The winning team will be the team with the longest list of small things.

There is a prize for each team member.





# Observing Small

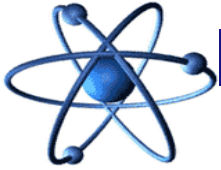
Small

Even smaller

And even smaller

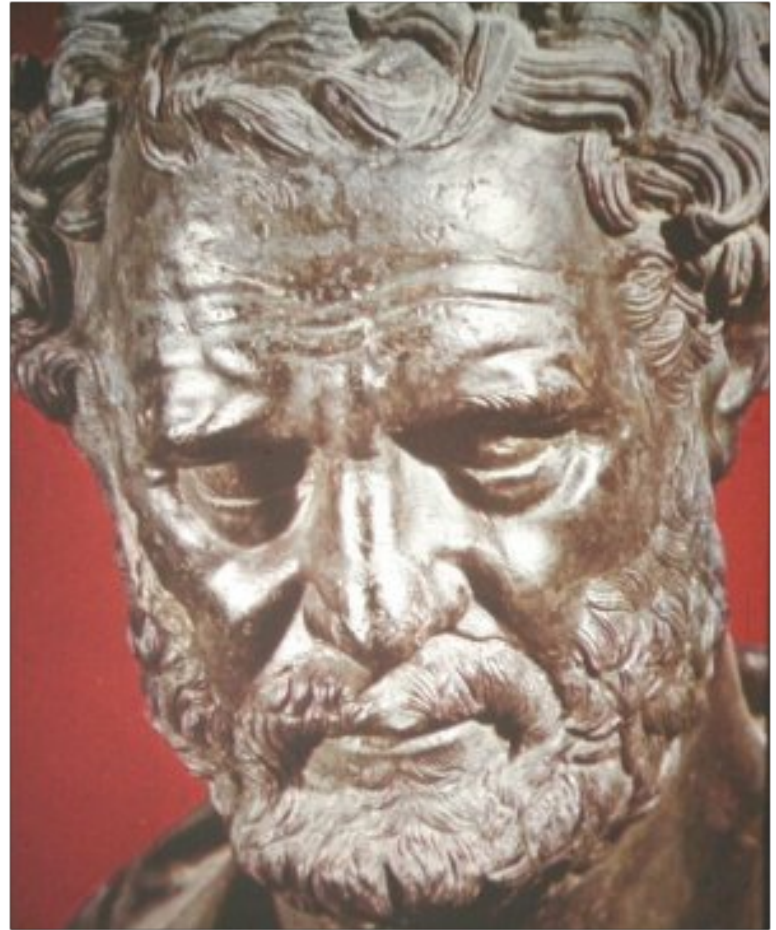


What is everything made of?

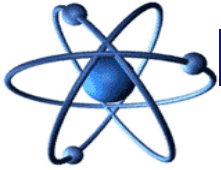


# The ancient philosophers' thoughts on Matter

- Greek theory – everything is made of small particles called “**atomos**”, the Greek word **indivisible**



Democritus



# Mind Experiment



**How small of a piece can you divide a loaf of bread?**



- Loaf
- Slice
- Cube (crouton)
- Crumb
- Flour
- Sugar
- Salt
- Yeast



- **Atoms are incredibly small.**
- **They're so small in fact, that in one drop of water there are...**

**1,700,000,000,000,000,000,000 atoms!**





# If that number of atoms were...



- **sheets of paper,**  
divided into a million  
equal piles, each pile  
would be so tall that  
it would stretch from  
the Earth to the Sun  
and beyond.



# If that number of atoms were...

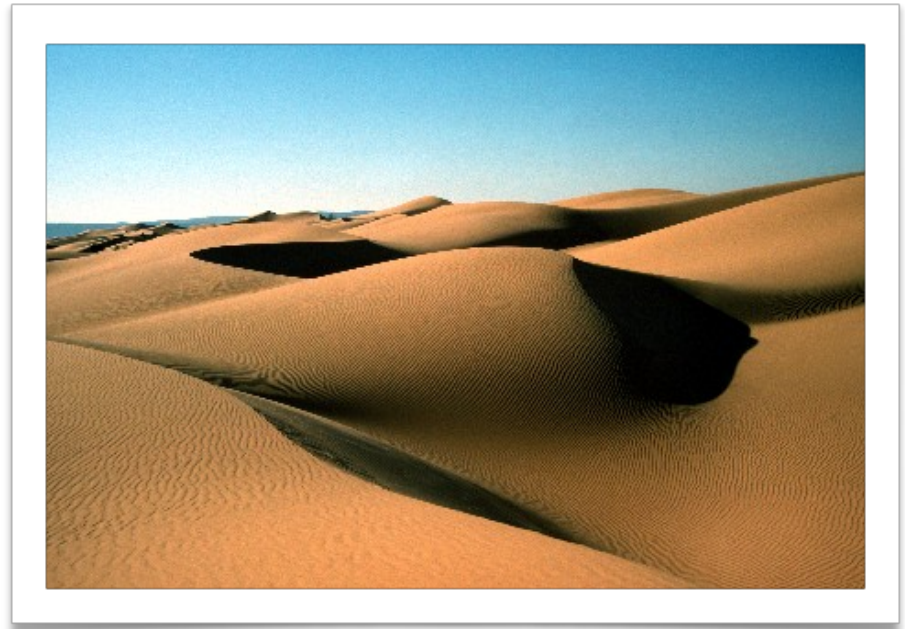
- pennies, placed side by side, they would stretch for more than a million light years.





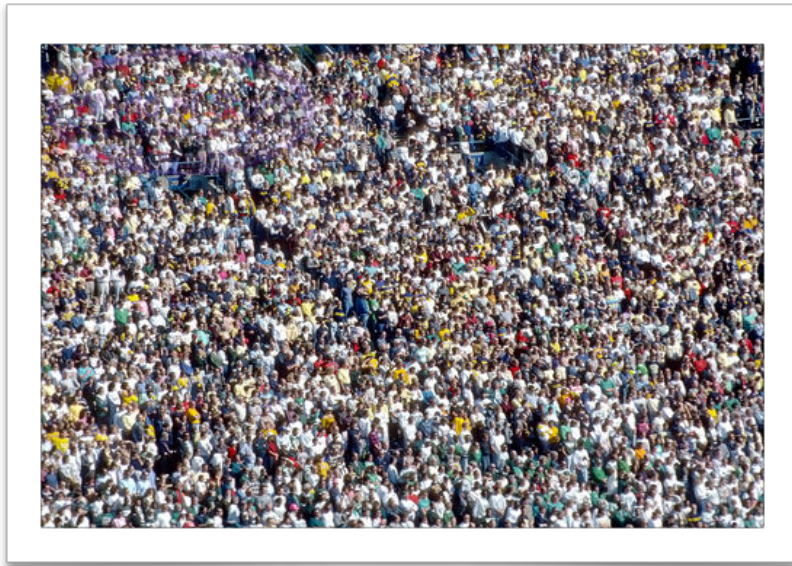
# If that number of atoms were...

- **grains of sand**, it would be necessary to dig the entire surface of the Sahara desert to a depth of 2 metres.





# If that number of atoms were...



- **Counted** at a rate of one atom per second, for 48 hours per week, it would take the entire population of the world 10 million years to reach it

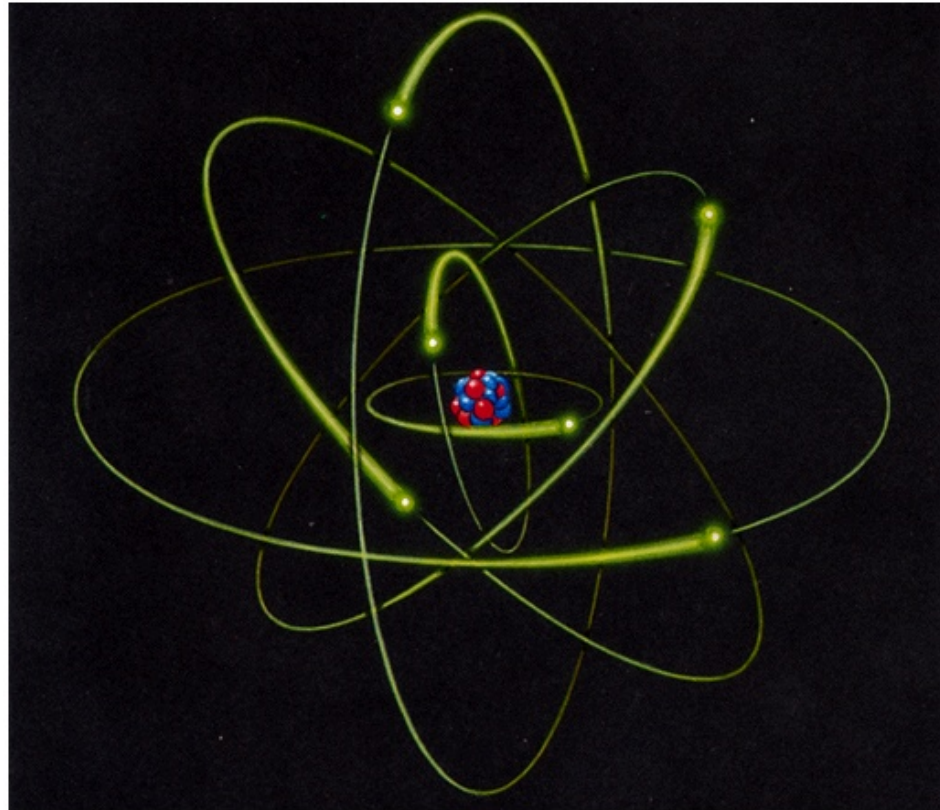
They're pretty small



## A Boy and His Atom



- Particle Theory of Matter

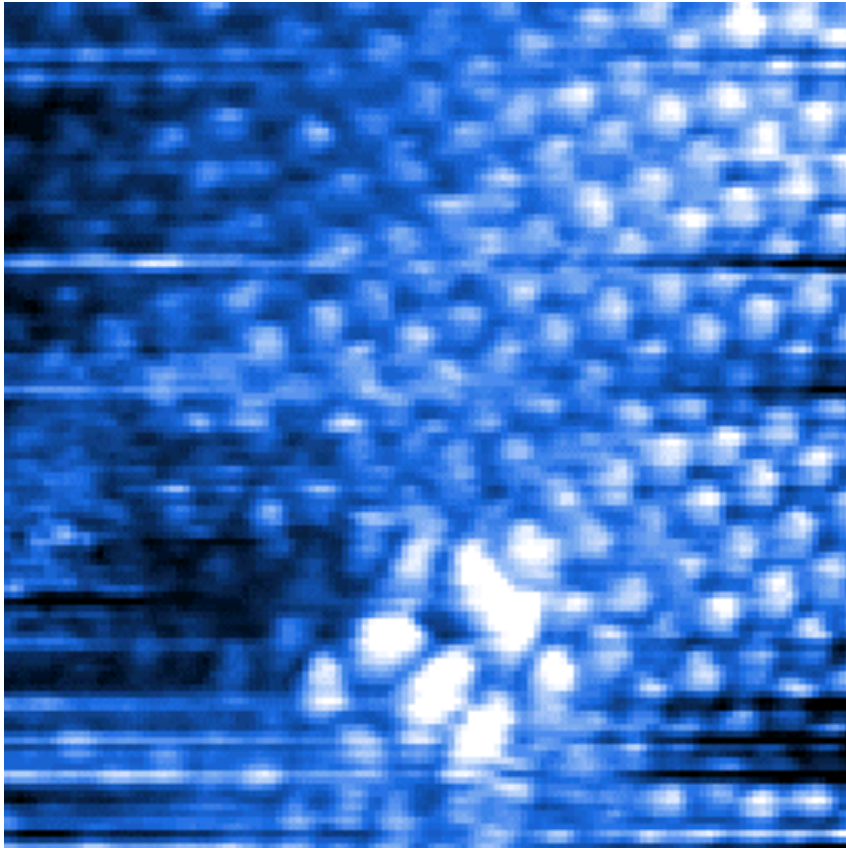


- **Particle Theory of Matter**
- **Everything is made of particles (atoms)**

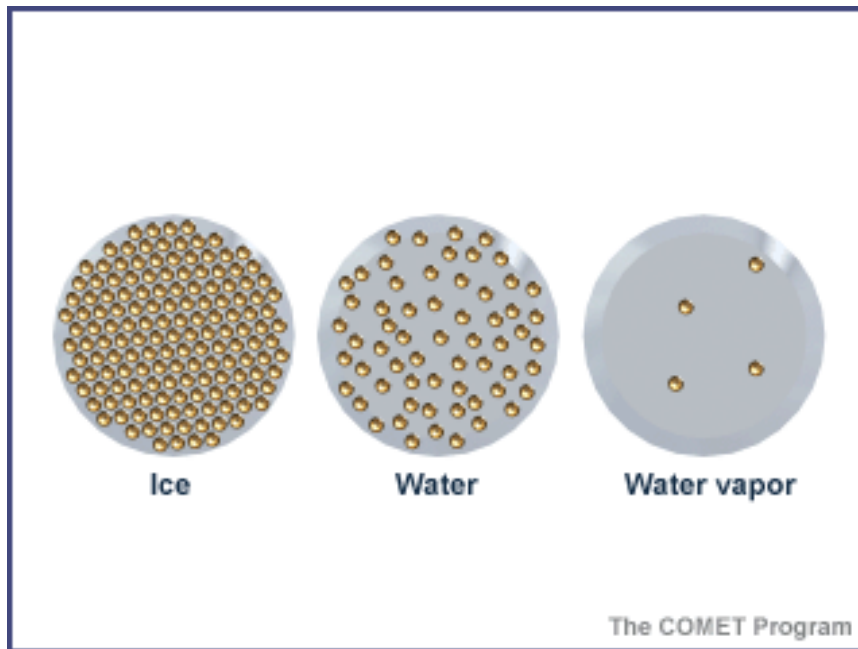


- **Particle Theory of Matter**
- **Everything is made of particles (atoms)**
- **These particles are always moving**

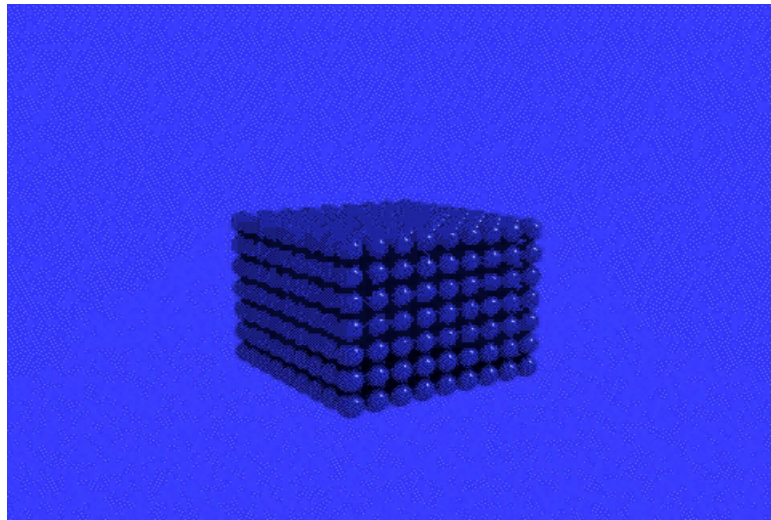




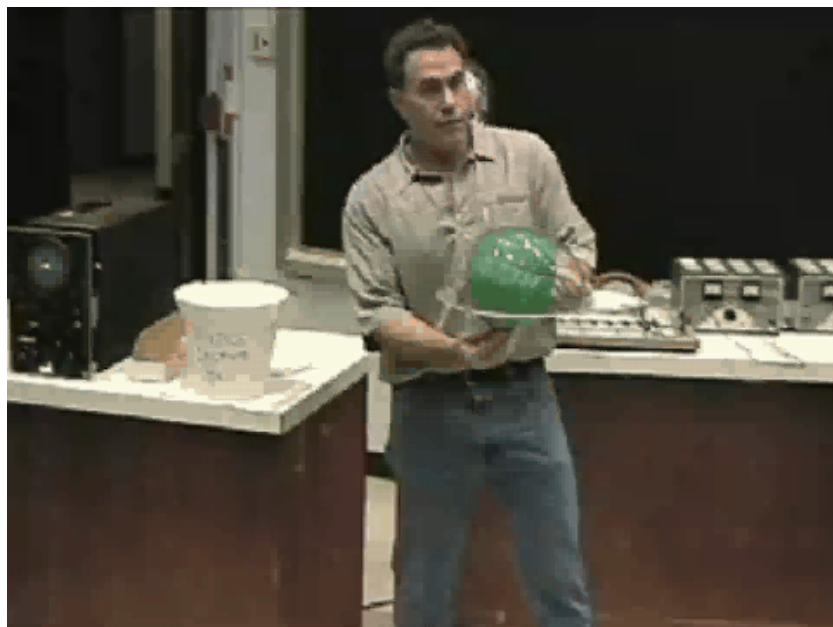
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- **Everything is made of particles (atoms)**
- **These particles are always moving**
- **Each pure substance has it's own type of particle**



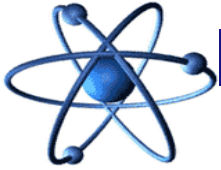
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- **Particle Theory of Matter**
- 1. Everything is made of particles (atoms)**
- 2. These particles are always moving**
- 3. Each pure substance has its own type of particle**
- 4. When these particles gain energy, they move faster and need more space**
- 5. When these particles lose energy, they move slower and need less space**



■ **Matter** – anything that takes up space and has mass.

■ It's **EVERYTHING!!**

