



# THE WORLD OF PARTICLES and their interactions

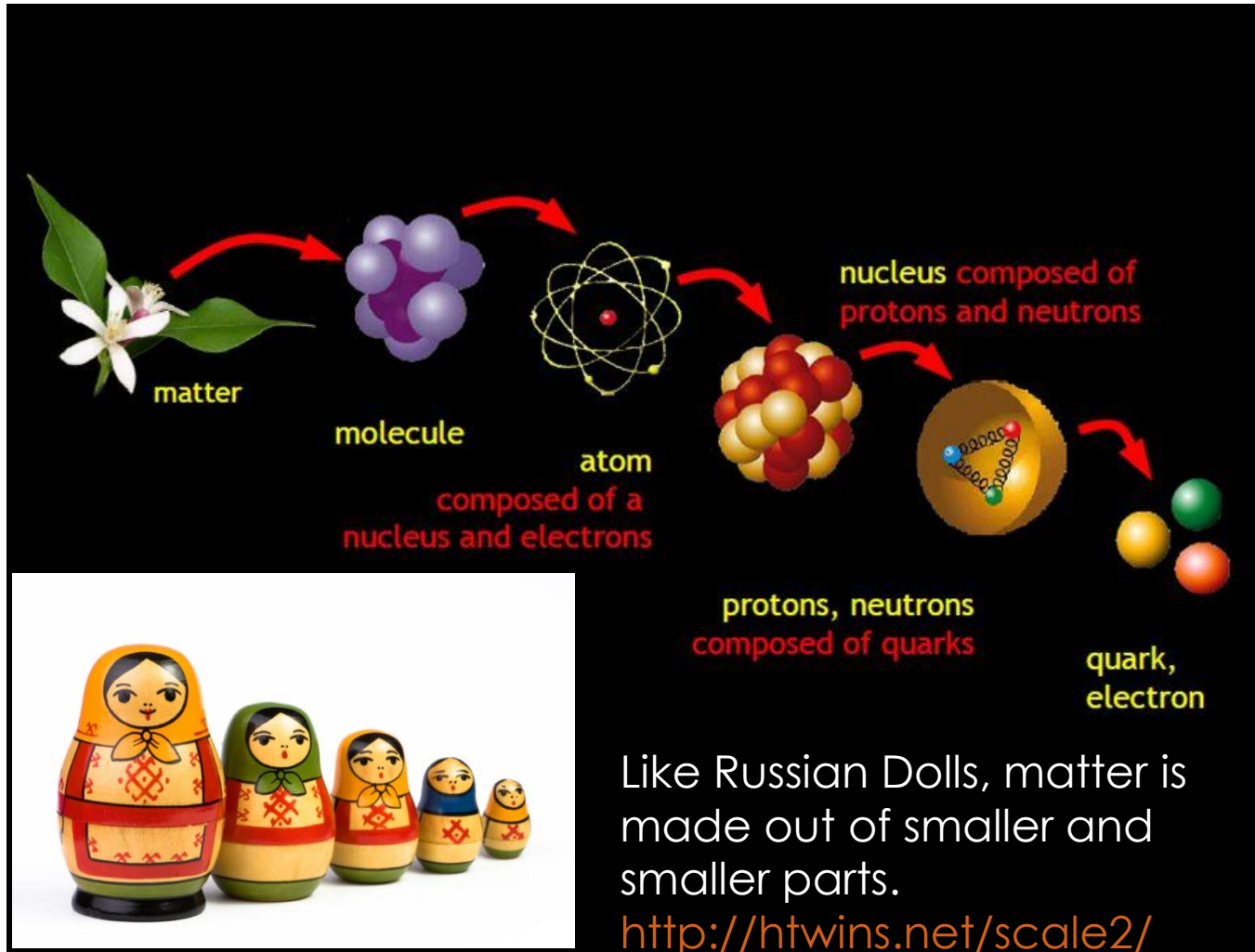
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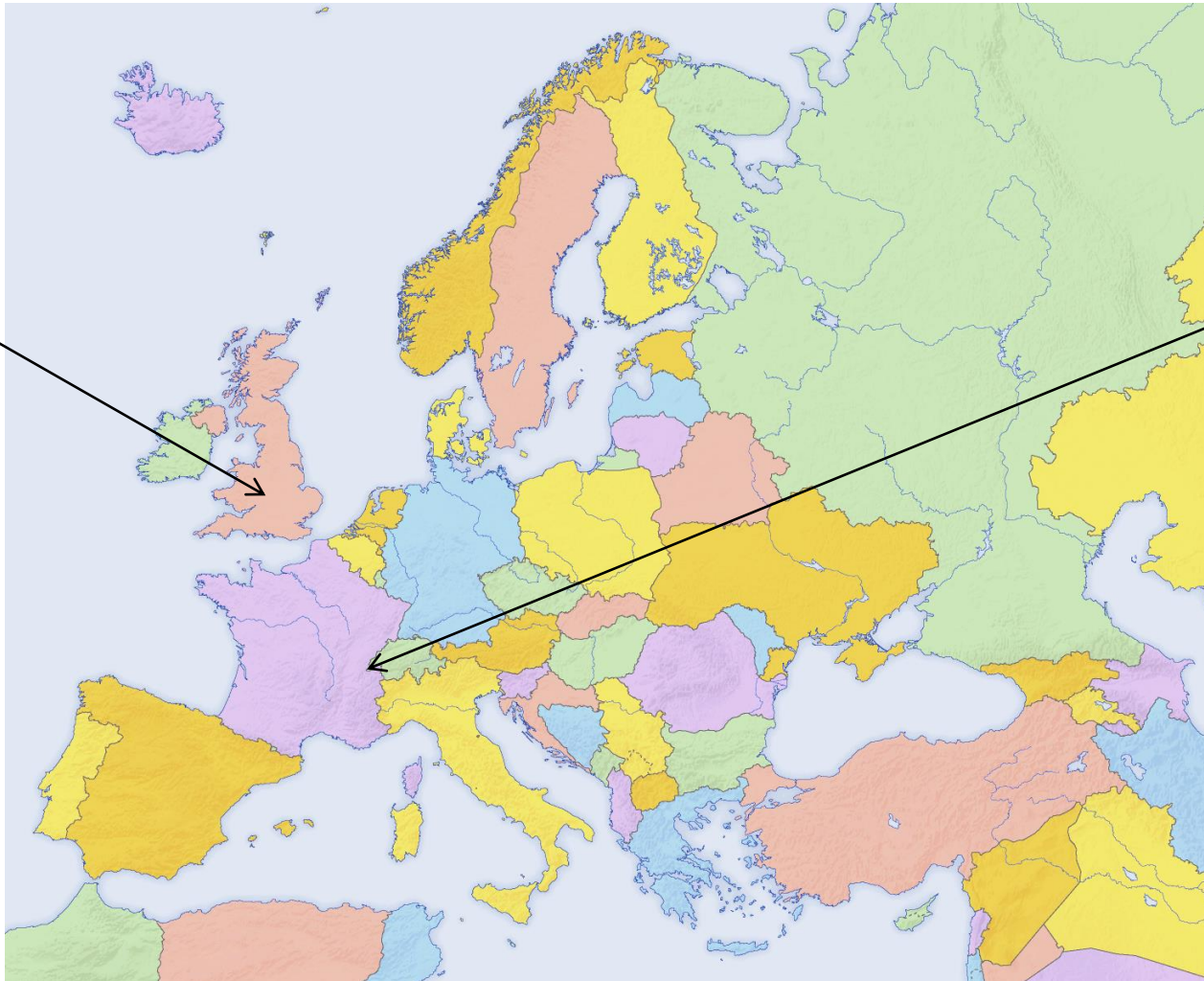
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# What are the building blocks of materials?



# Where is CERN?

you are here

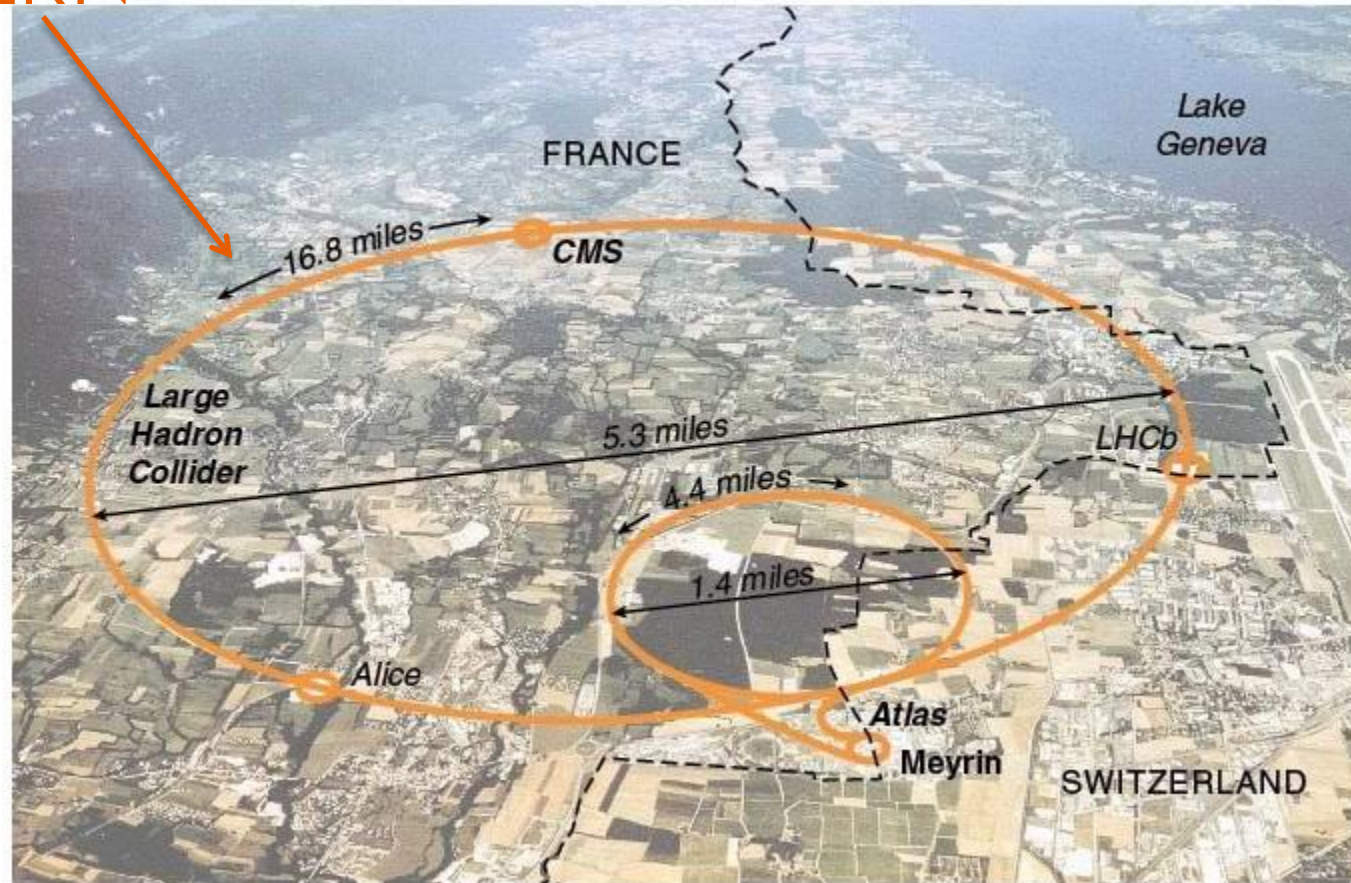


CERN



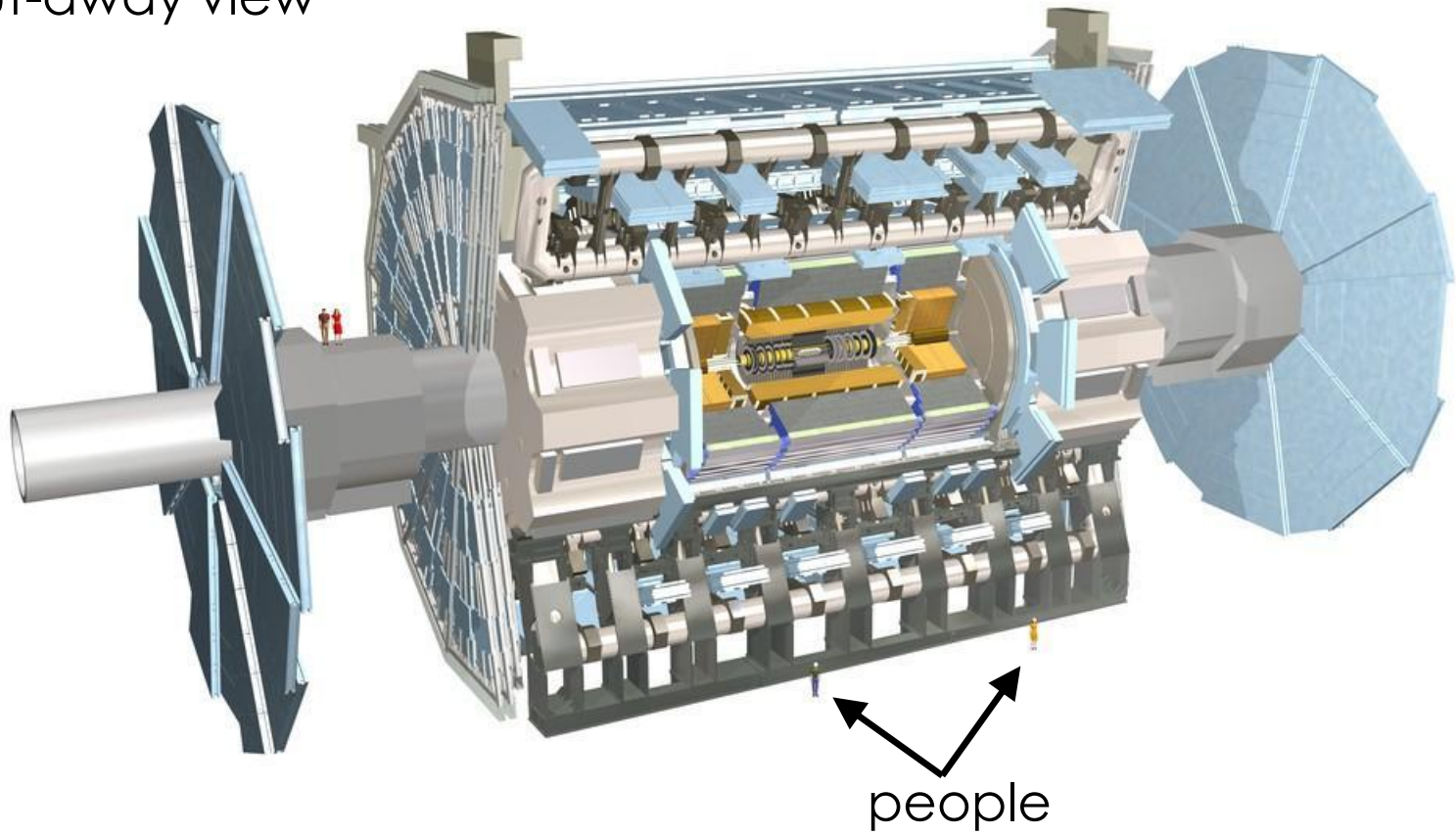
# The Large Hadron Collider at CERN

CERN



# What is ATLAS?

cut-away view



# The particle zoo: the Quark family



**Name:** Up  
**Surname:** Quark



**Name:** Charm  
**Surname:** Quark



**Name:** Top  
**Surname:** Quark



**Name:** Down  
**Surname:** Quark



**Name:** Strange  
**Surname:** Quark



**Name:** Beauty  
**Surname:** Quark

# The particle zoo: the Lepton family



**Name:** Electron  
**Surname:** Lepton



**Name:** Muon  
**Surname:** Lepton



**Name:** Tau  
**Surname:** Lepton



**Name:** Electron  
Neutrino  
**Surname:** Lepton



**Name:** Muon  
Neutrino  
**Surname:** Lepton



**Name:** Tau Neutrino  
**Surname:** Lepton

# The particle zoo: the Boson family



**Name:** Gluon  
**Surname:** Boson



**Name:** Photon  
**Surname:** Boson



**Name:** Z  
**Surname:** Boson



**Name:** W Plus  
**Surname:** Boson



**Name:** W Minus  
**Surname:** Boson



**Name:** Higgs  
**Surname:** Boson



# Matter and Anti-matter



**Matter:** with one white feature e.g. white hat



**Anti-matter:** with the same feature in black e.g. black hat



# Task 1: Happy Families game

Your aim is to collect all six members of any of the families:

- ❑ Quarks
- ❑ Anti-quarks
- ❑ Leptons
- ❑ Anti-leptons
- ❑ Bosons

The player who collects the most families is the winner.



# Rules of the Happy Families game

- The aim of the game is to collect as many families (groups of 6 cards that belong to the same family) as possible.
- Deal out all the cards so that every player gets an almost equal number of cards; this will depend on the number of players.
- The dealer starts by asking another player for a card needed to complete a family.
- If the other player has the card, they must give it to this player.
- The player may continue asking for cards until they make a mistake.
- When a mistake is made the player who was asked for their card takes their turn to request cards.
- During the game, players can request and retake the cards taken from them in previous rounds.
- When a player gathers a family they must put the 6 cards face down on the table in front of them.
- The player who collects the most families is the winner.



## Task 2: Make your own particle !



- ❑ Read the trump card of your particle
- ❑ Design your particle and draw your design on the trump card
- ❑ Give mass to your particle by adding plasticine
- ❑ Make your particle using the resources



# References

- Slide 2: building blocks of matter from <http://rooksheathscience.com/2014/06/>, Russian dolls from <http://www.kzero.co.uk/>
- Slide 3: Europe map from [http://commons.wikimedia.org/wiki/Atlas\\_of\\_Europe](http://commons.wikimedia.org/wiki/Atlas_of_Europe)
- Slide 4: map of LHC from <http://imgarcade.com/1/lhc-map/>
- Slide 5: ATLAS from <http://atlas.ch/>
- Slides 6, 7,8, 9: the particle zoo from <http://www.particlezoo.net/>

