



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA  
DEPARTMENT OF PHYSICS AND ASTRONOMY  
"AUGUSTO RIGHI"



CosmicAntiNuclei



**inVISIBILI**

**HIDDeN Outreach Project  
in Bologna**

**Elina Merkel - HIDDeN ESR**

**04-06-2024**





# Outline



- inVISIBILI in a nutshell
- motivation for inVISIBILI
- our volunteers
- classroom activities
- escape room book
- gender biases study
- feedback and results
- summary and takeaways

# inVISIBILI in a nutshell



# inVISIBILI in a nutshell



Outreach for 5-10 y.o.  
children  
in Bologna



# inVISIBILI in a nutshell



Outreach for 5-10 y.o.  
children  
in Bologna

Curiosity about  
invisible universe



# inVISIBILI in a nutshell



Outreach for 5-10 y.o. children in Bologna

Curiosity about invisible universe

Inclusive approach, female role models



# inVISIBILI in a nutshell



Outreach for 5-10 y.o. children in Bologna

Curiosity about invisible universe

Inclusive approach, female role models

Studying gender stereotypes in children



# inVISIBILI in a nutshell



Outreach for 5-10 y.o. children in Bologna

Curiosity about invisible universe

Inclusive approach, female role models

Studying gender stereotypes in children

Physicists go to kindergartens & primary schools





# inVISIBILI in a nutshell



Outreach for 5-10 y.o. children in Bologna

Curiosity about invisible universe

Inclusive approach, female role models

Studying gender stereotypes in children

Physicists go to kindergartens & primary schools

~ 60 classes  
~ 1.600 children  
~ 60 physicists

# inVISIBILI in a nutshell



Outreach for 5-10 y.o. children in Bologna

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~ 60 classes  
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Prof. Silvia Pascoli



Prof. Francesca Bellini



Prof. Laura Fabbri



Lorenza Vianello



# inVISIBILI in a nutshell



Outreach for 5-10 y.o. children in Bologna

Curiosity about invisible universe

Inclusive approach, female role models



Diego Jimenez Sanz



Elina Merkel



inVISIBILI

Studying gender stereotypes in children

Physicists go to kindergartens & primary schools

~ 60 classes  
~ 1.600 children  
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# Motivation for inVISIBILI



- [1] European Commission (2019). *Report on Equality Between Women and Men in the EU*. Luxembourg: Publications Office of the European Union.
- [2] WISE (2019). *Analysis of 2019 A Level Core STEM Entrants and Results*. London: WISE.
- [3] J. R. Shapiro, and A. M. Williams. The role of stereotype threats in undermining girls' and women's performance and interest in STEM fields. *Sex Roles* 66 (2012) 175–183. doi: 10.1007/s11199-011-0051-0
- [4] S. J. Leslie, A. Cimpian, M. Meyer, and E. Freeland, Expectations of brilliance underlie gender distributions across academic disciplines. *Science* 347 (2015) 262–265. doi: 10.1126/science.1261375
- [5] M. Meyer, A. Cimpian, and S. J. Leslie, Women are underrepresented in fields where success is believed to require brilliance. *Front. Psychol.* 6 (2015) 235. doi: 10.3389/fpsyg.2015.00235
- [6] L. Bian, S. J. Leslie, and A. Cimpian, A.. Gender stereotypes about intellectual ability emerge early and influence children's interests. *Science* 355 (2017) 389–391. doi: 10.1126/science.aah6524
- [7] F. Law, L. McGuire, M. Winterbottom, A. Rutland, Children's Gender Stereotypes in STEM Following a One-Shot Growth Mindset Intervention in a Science Museum, *Front. Psychol.* 10 (2021). 10.3389/fpsyg.2021.641695



# Motivation for inVISIBILI



inVISIBILI

Women are  
strongly  
underrepresented  
in STEM [1, 2]

[1] European Commission (2019). *Report on Equality Between Women and Men in the EU*. Luxembourg: Publications Office of the European Union.

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# Motivation for inVISIBILI



Gender stereotypes  
about intellectual  
brilliance develop  
from an early age  
[3,4,5,6,7]



Women are  
strongly  
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in STEM [1, 2]

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# Motivation for inVISIBILI



Gender stereotypes about intellectual brilliance develop from an early age [3,4,5,6,7]

Women are strongly underrepresented in STEM [1, 2]

Inclusive outreach for kindergartens and primary schools!

[1] European Commission (2019). *Report on Equality Between Women and Men in the EU*. Luxembourg: Publications Office of the European Union.

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# Volunteers



in**VISIBILI**





# Volunteers



- Around 60 physicists

# Volunteers



- Around 60 physicists
- Teams: senior & 2-3 juniors



# Volunteers



- Around 60 physicists
- Teams: senior & 2-3 juniors
  
- Training:



# Volunteers



- Around 60 physicists
- Teams: senior & 2-3 juniors
  
- Training:
  - >> invisible universe



# Volunteers



- Around 60 physicists
- Teams: senior & 2-3 juniors
  
- Training:
  - >> invisible universe
  - >> gender issues



# Volunteers



- Around 60 physicists
- Teams: senior & 2-3 juniors (at least one female)
- Training:
  - >> invisible universe
  - >> gender issues
  - >> outreach for children



inVISIBILI



iors

- Training:
  - >> invisible universe
  - >> gender issues
  - >> outreach for children



BILI



- Training:
  - >> invisible universe
  - >> gender issues
  - >> outreach for children







BILI



Eliina Merkel, 04-06-2024





BILI



# Volunteers



Elna Merkel, 04-06-2024

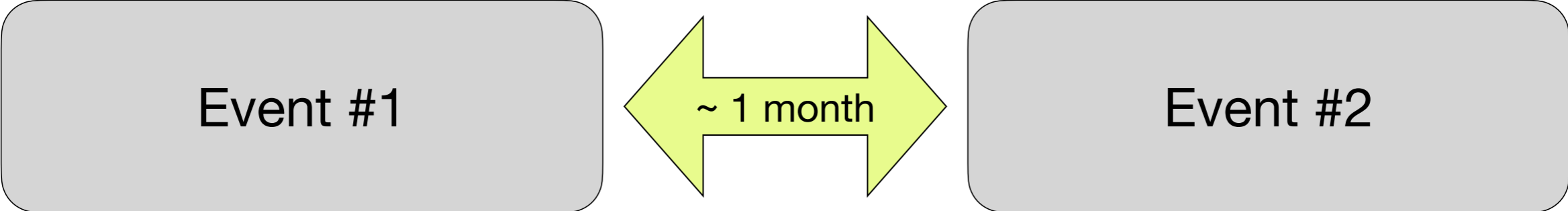
# Classroom activities



in**VISIBILI**



# Classroom activities



# Classroom activities



Event #1

~ 1 month

Event #2

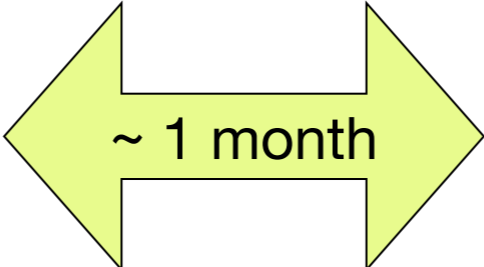
- invisible forces
- scientific approach



# Classroom activities



Event #1



Event #2

- invisible forces
- scientific approach

- elementary particles
- invisible particles





## Event #1

- invisible forces
- scientific approach



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## Event #1

- invisible forces
- scientific approach



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Event #1

- invisible forces
- scientific approach



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Eliina Merkel, 04-06-2024





Event #1

- invisible forces
- scientific approach



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# Event #1

- invisible forces
- scientific approach



inVISIBILI



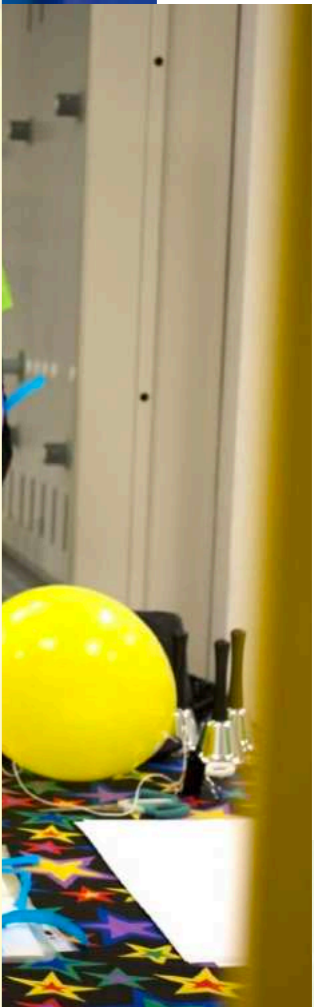


Event #1

- invisible forces
- scientific approach



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## Event #2

- elementary particles
- invisible particles



inVISIBILI



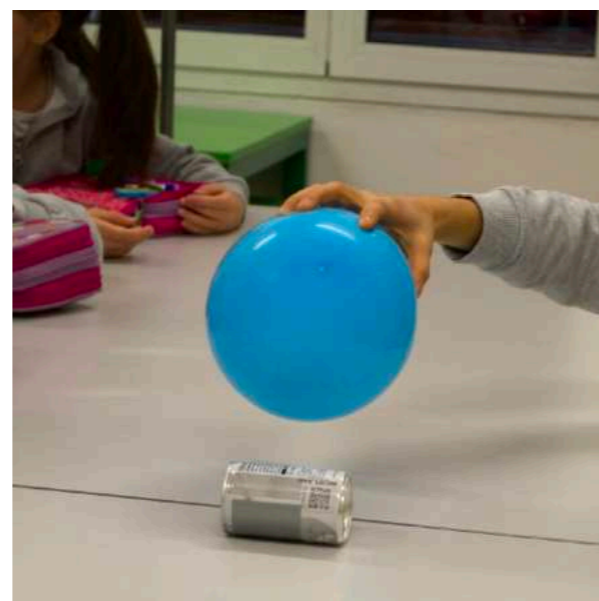


## Event #2

- elementary particles
- invisible particles



inVISIBILI



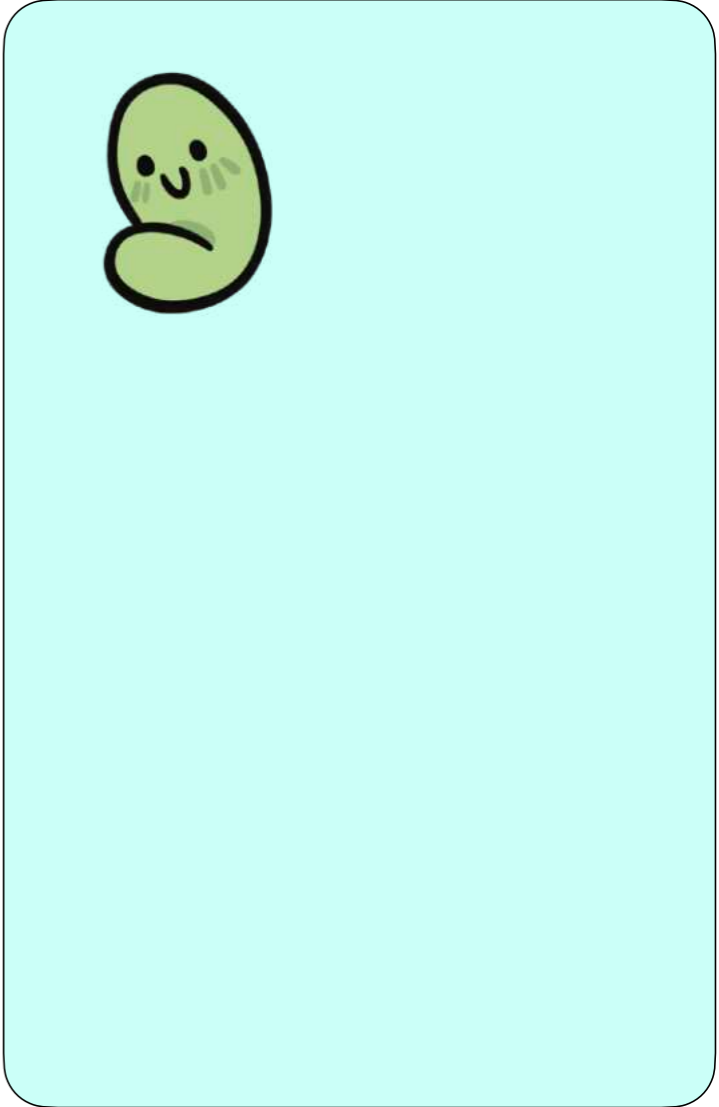
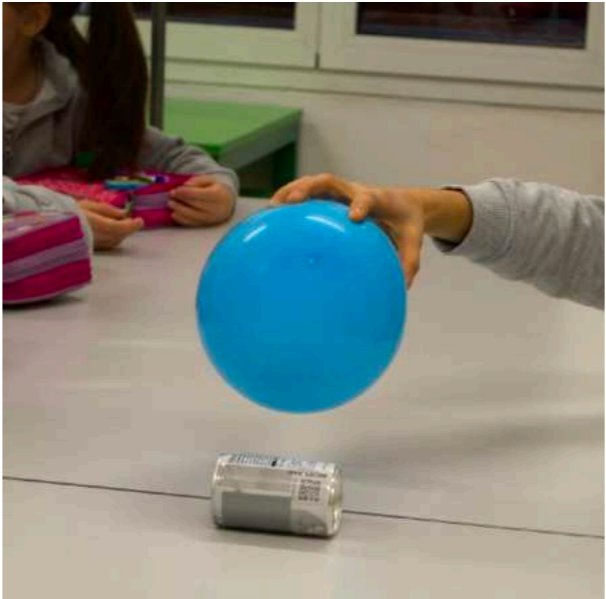


Event #2

- elementary particles
- invisible particles



inVISIBILI



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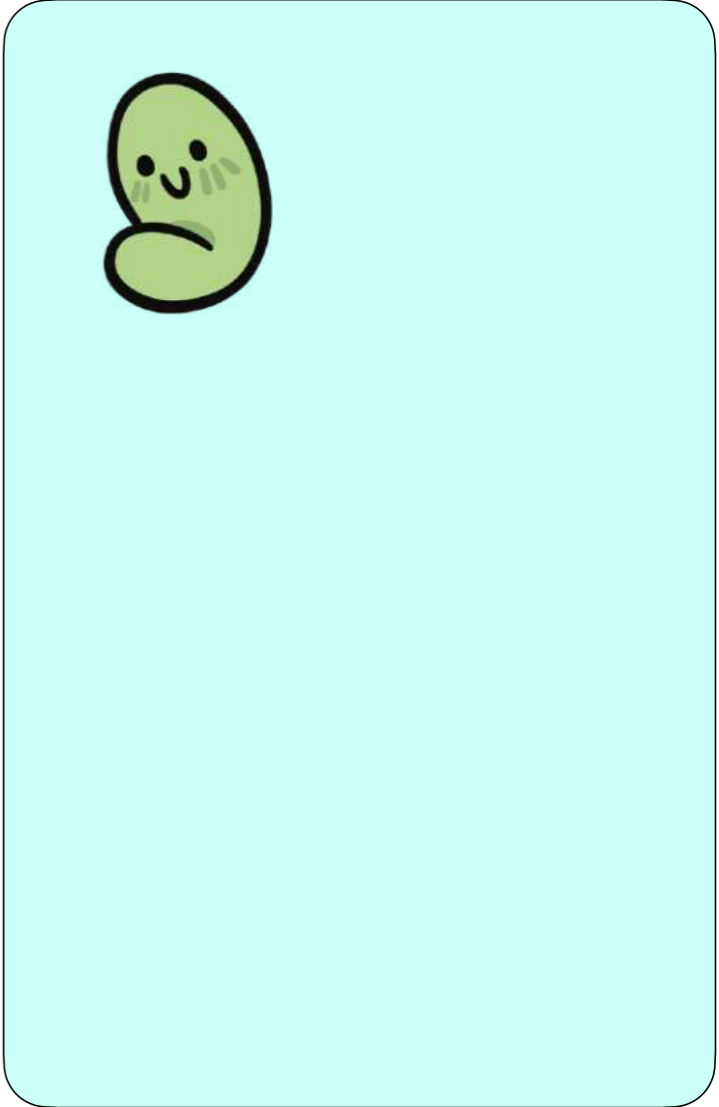
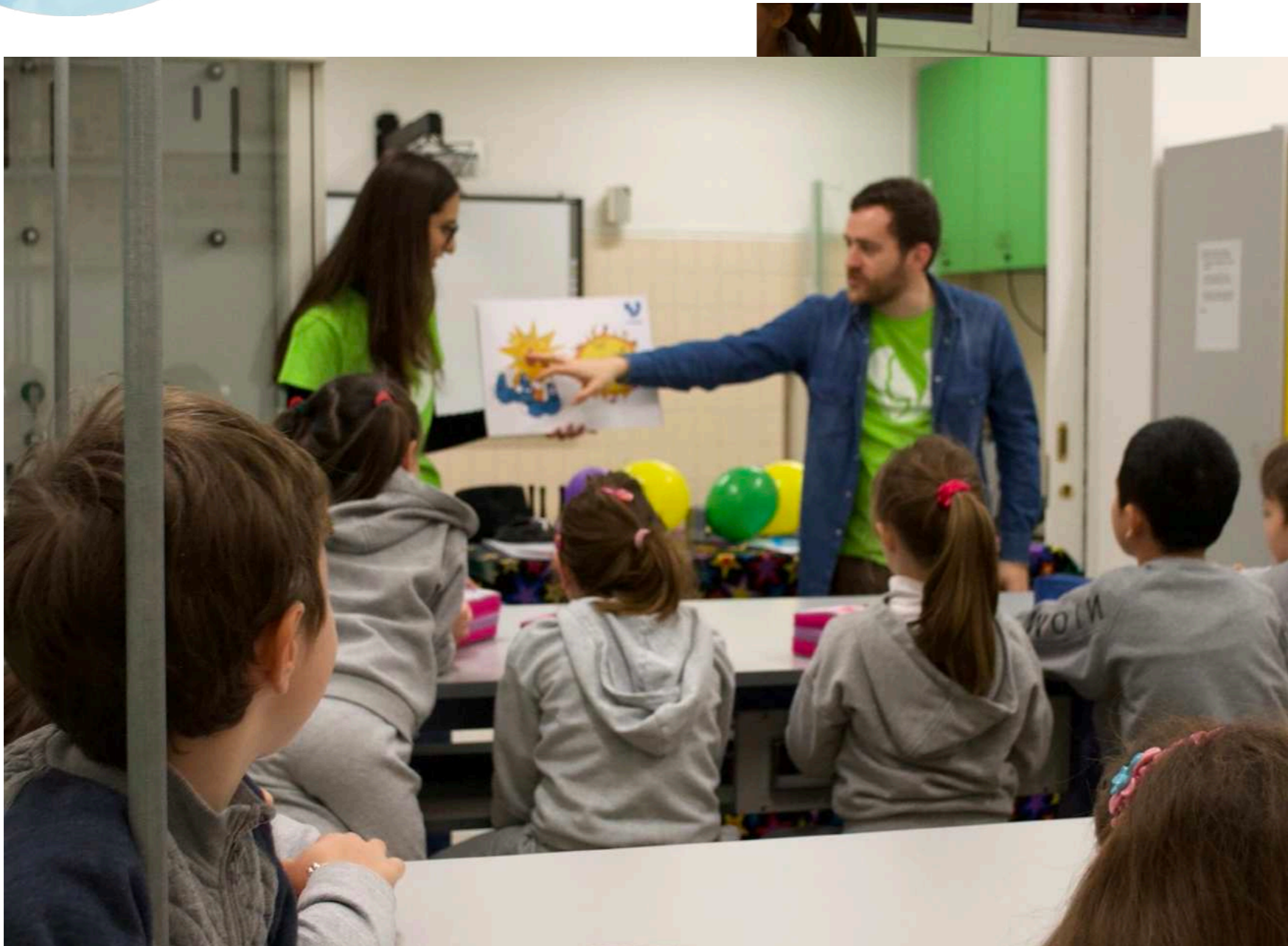


Event #2

- elementary particles
- invisible particles



inVISIBILI



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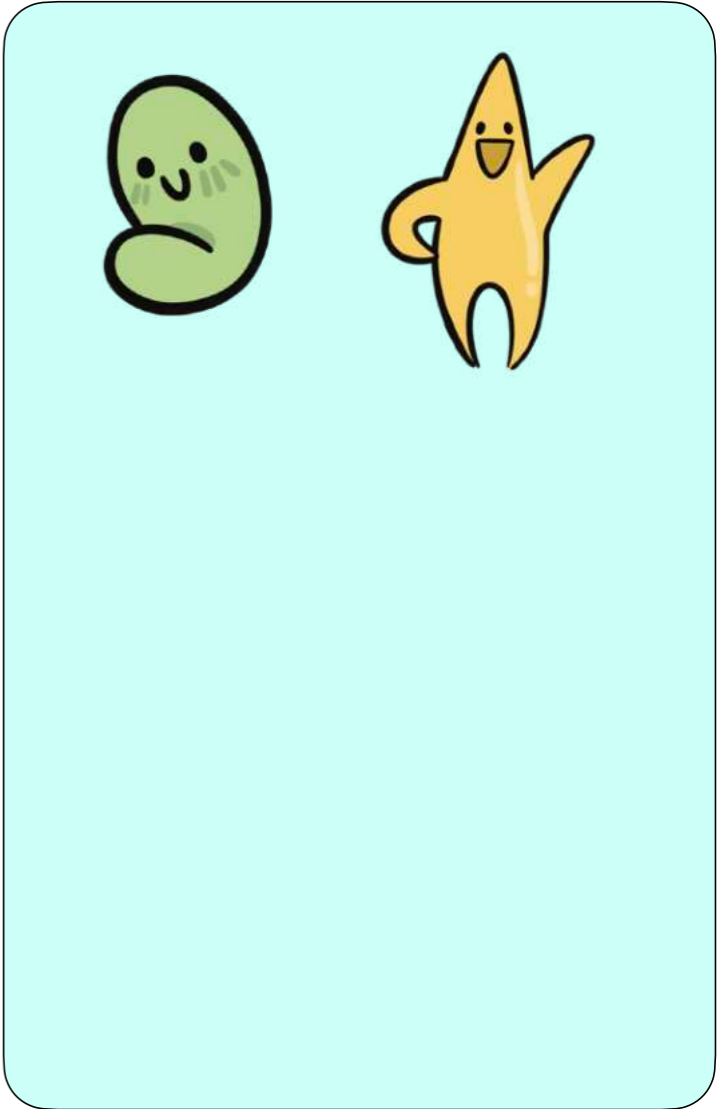
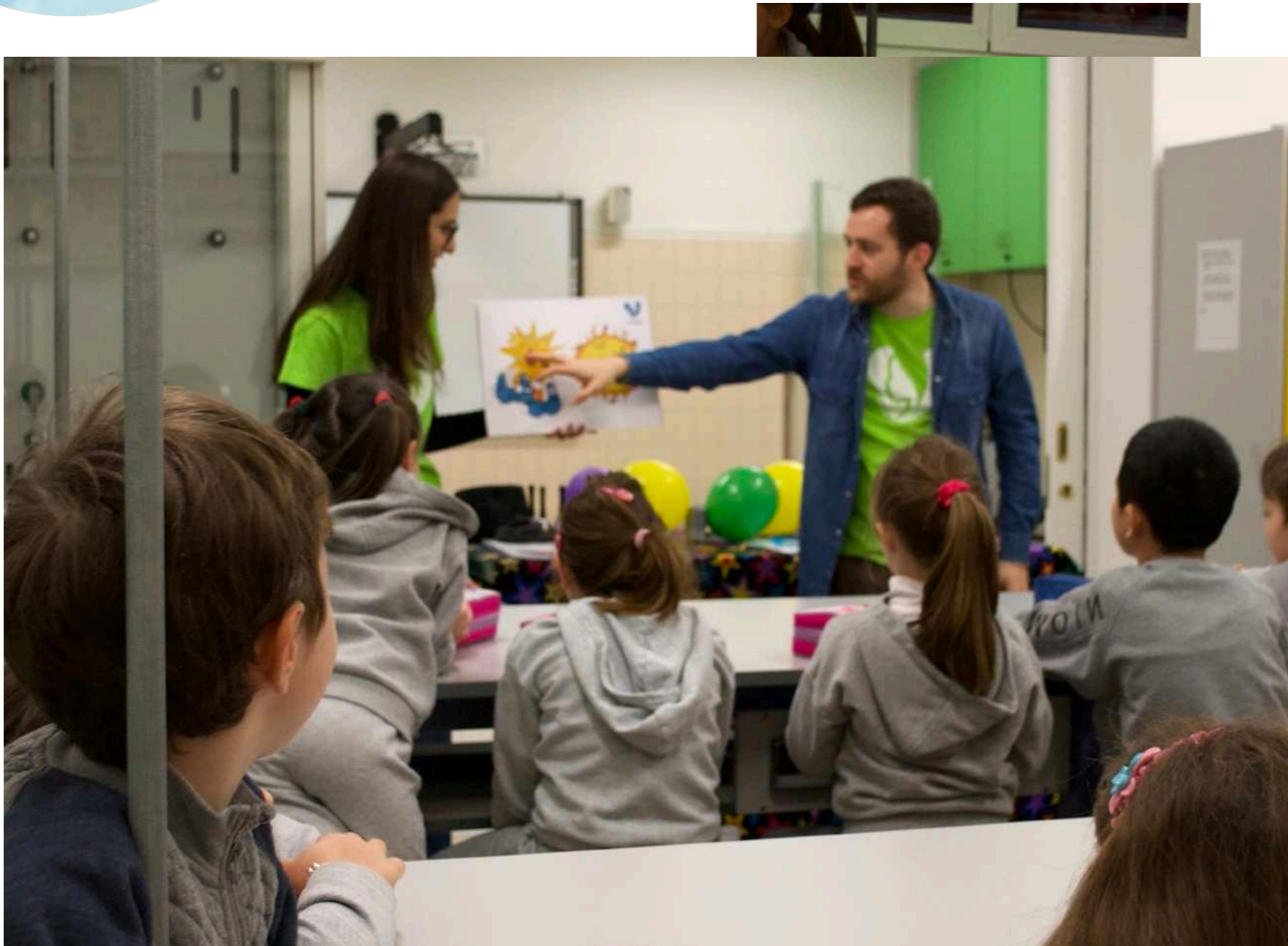


Event #2

- elementary particles
- invisible particles

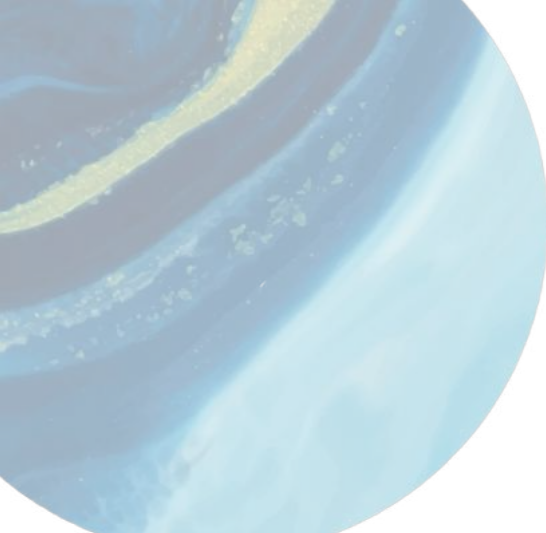


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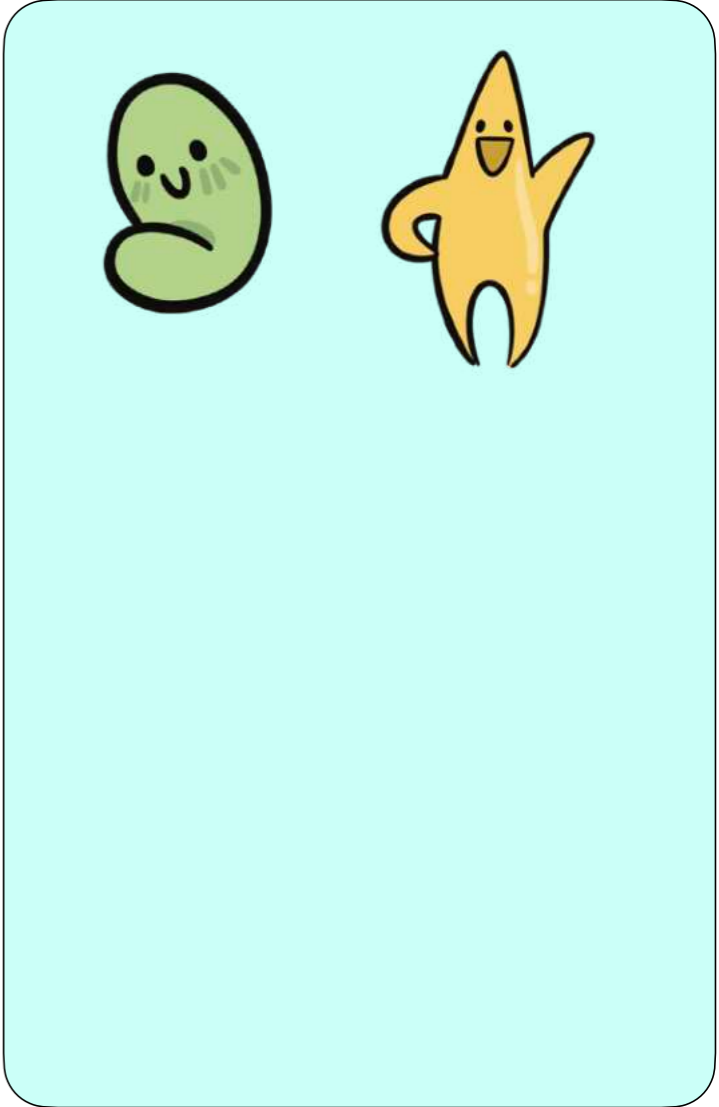
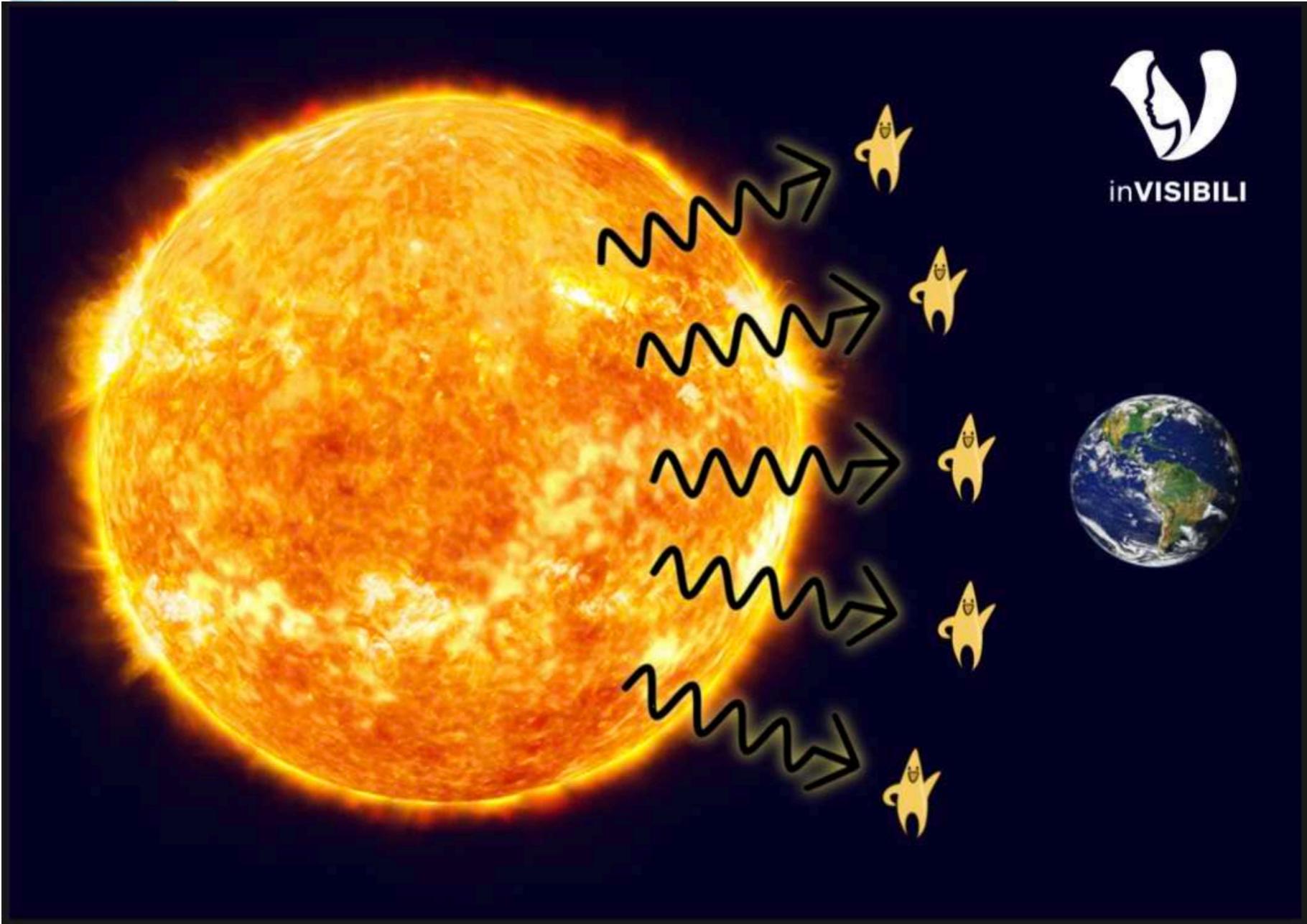


Event #2

- elementary particles
- invisible particles



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Graphic design by Gaia Fontana



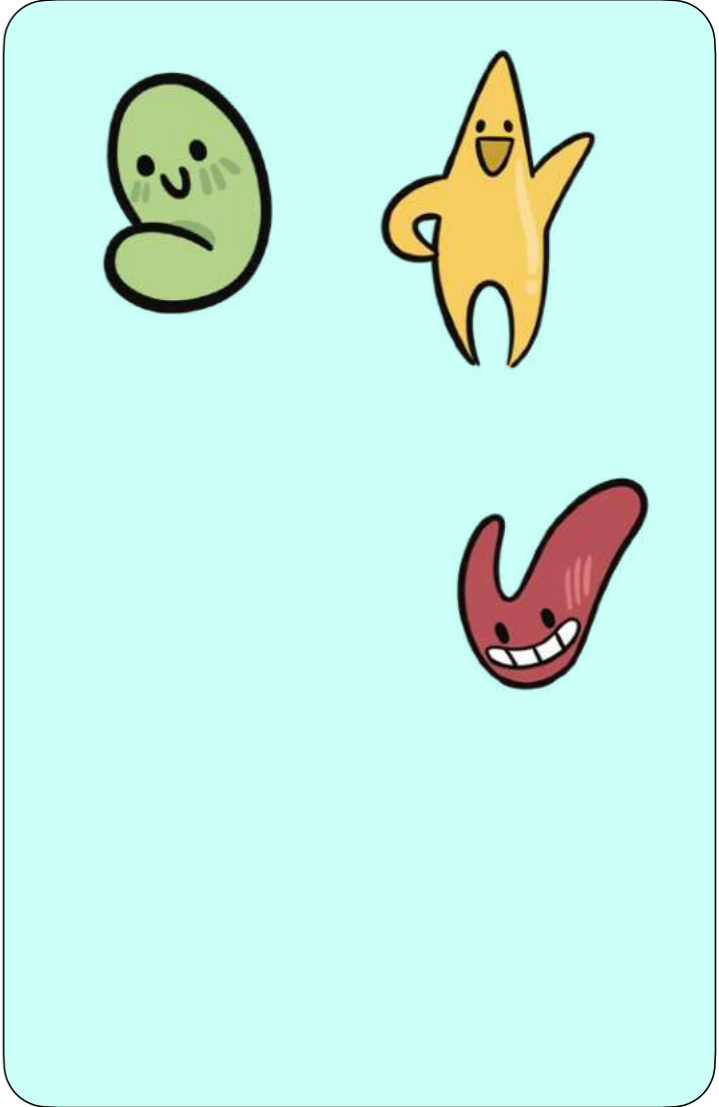
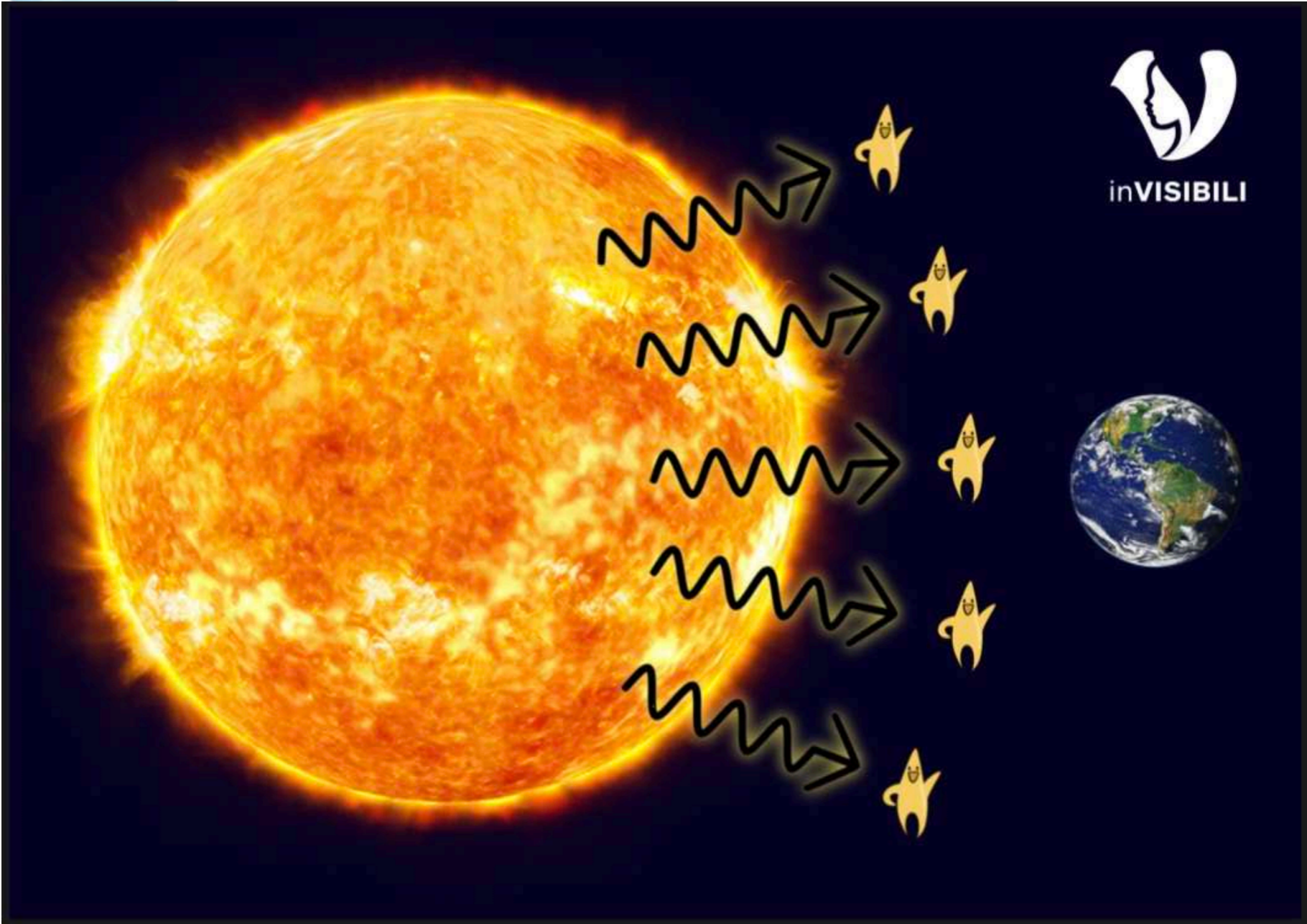


Event #2

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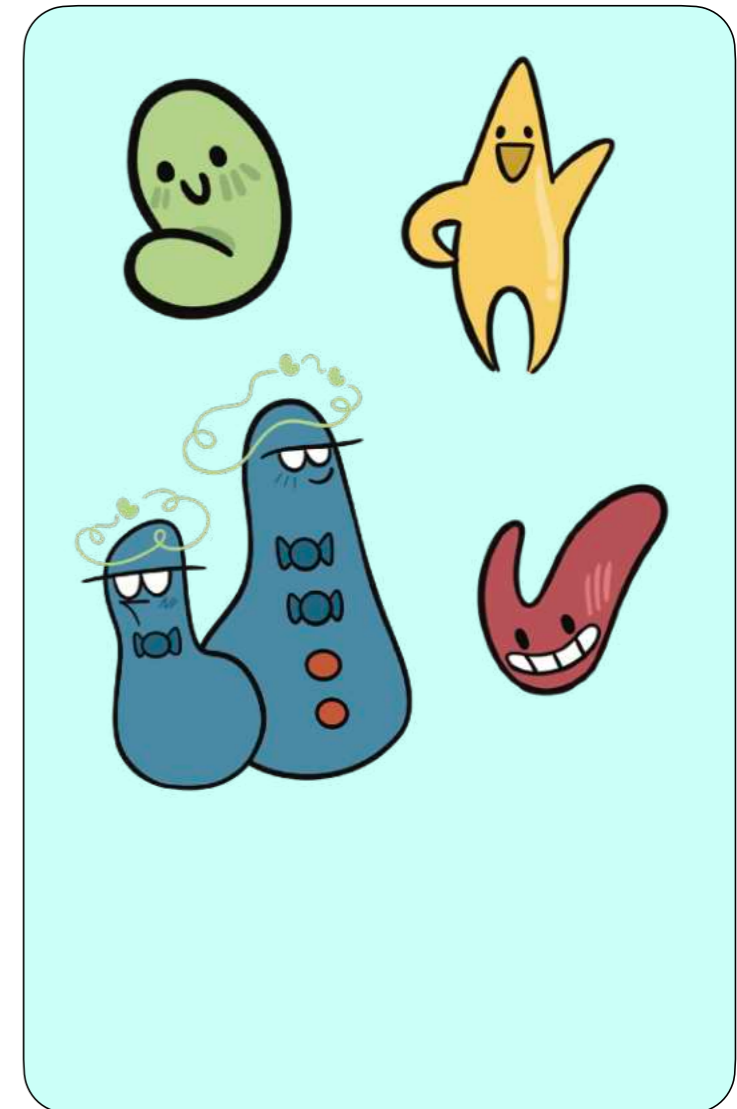
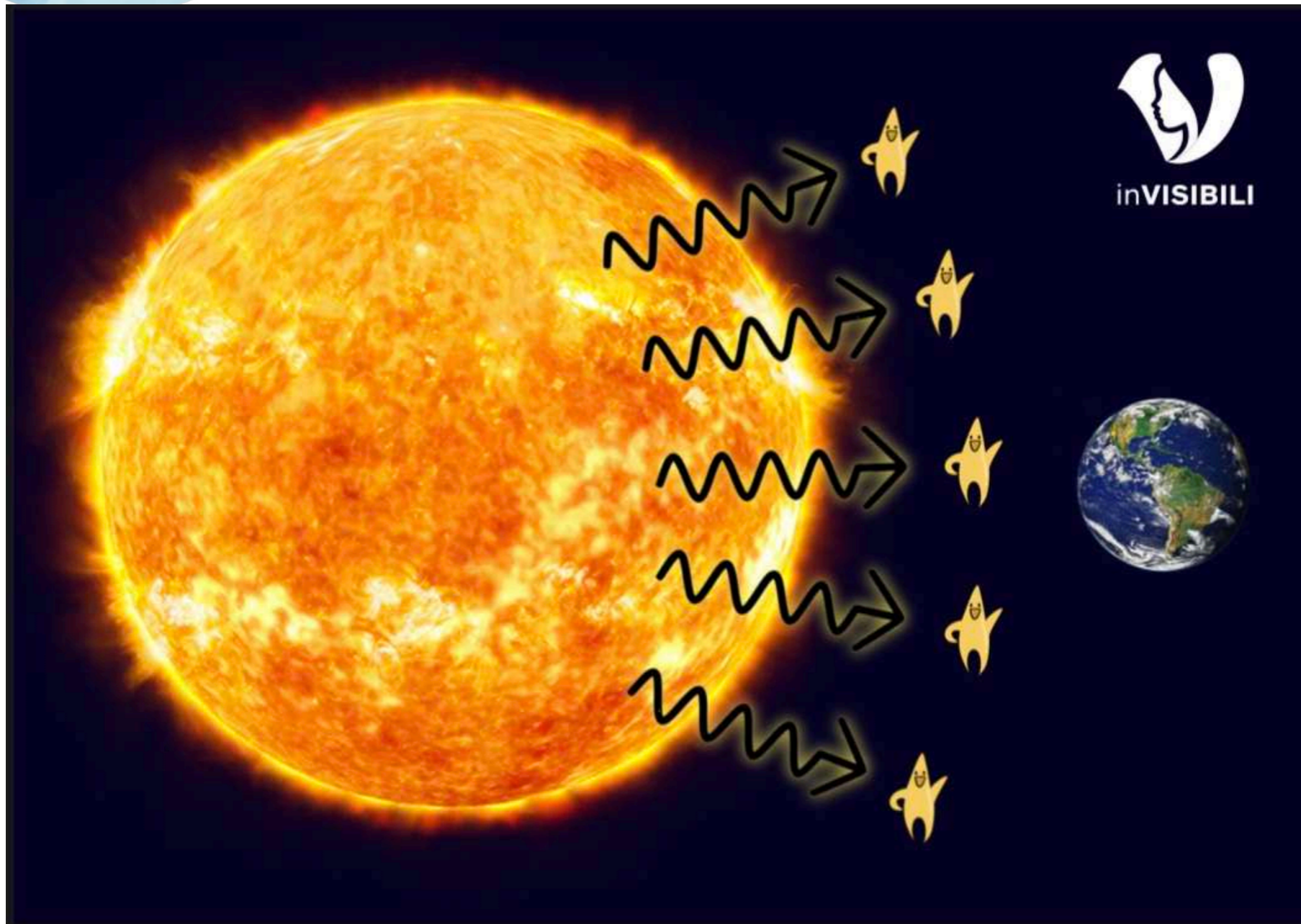


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## Event #2

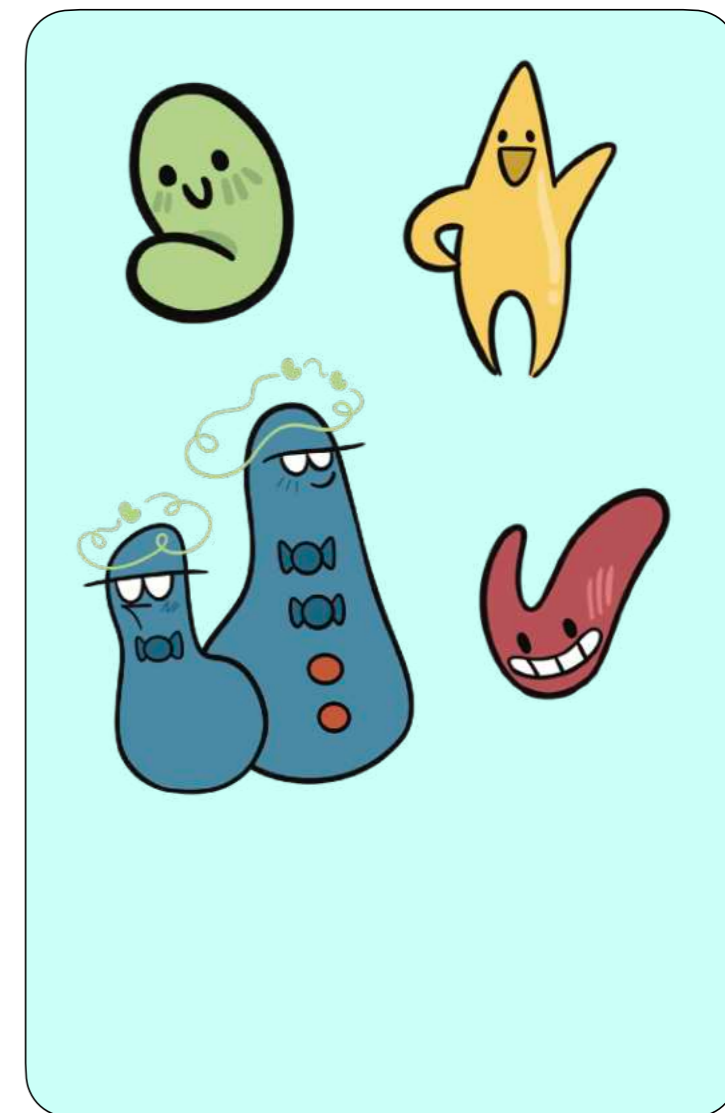
- elementary particles
- invisible particles



Graphic design by Gaia Fontana

## Event #2

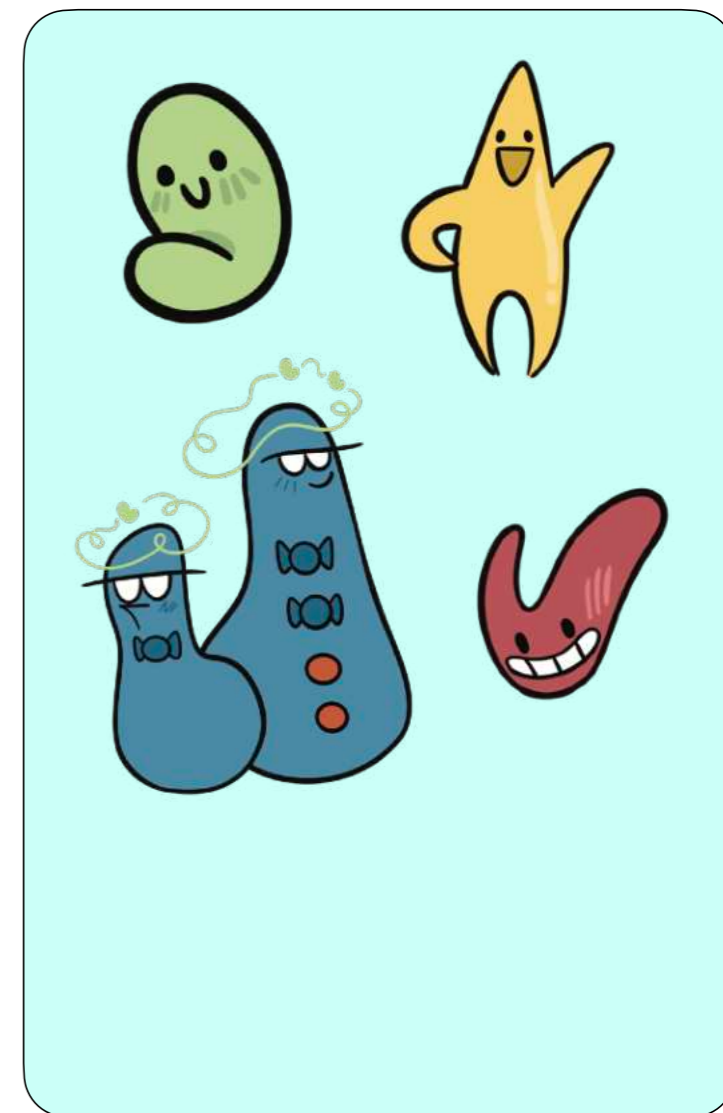
- elementary particles
- invisible particles



Graphic design by Gaia Fontana

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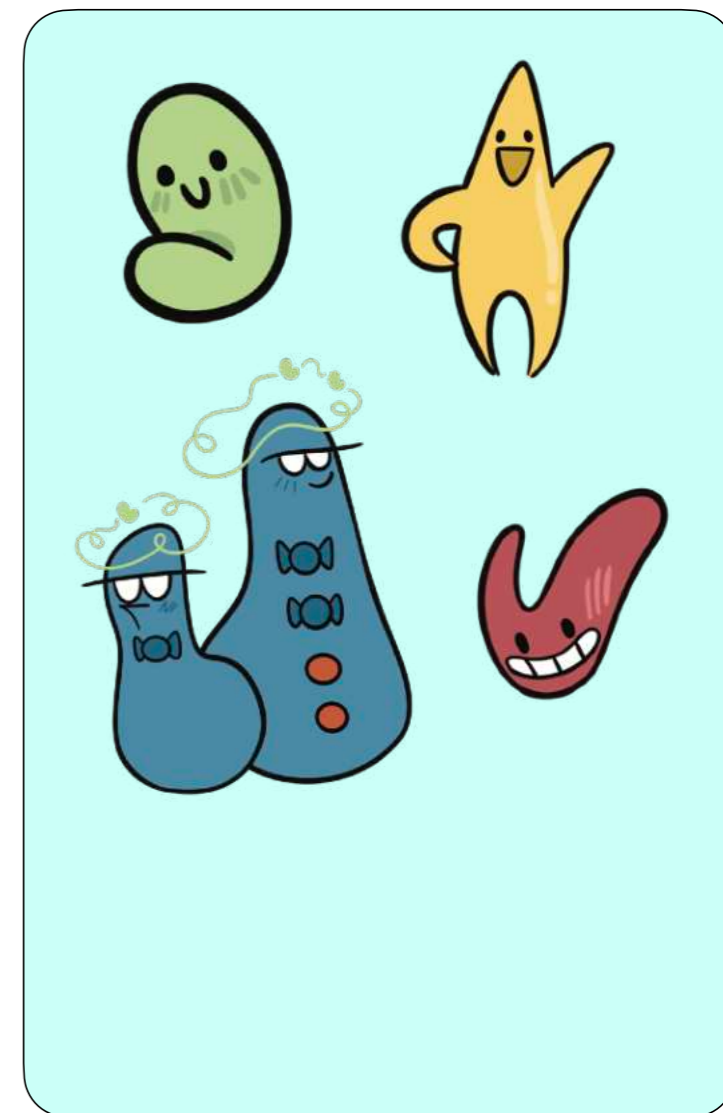
- elementary particles
- invisible particles



Graphic design by Gaia Fontana

## Event #2

- elementary particles
- invisible particles

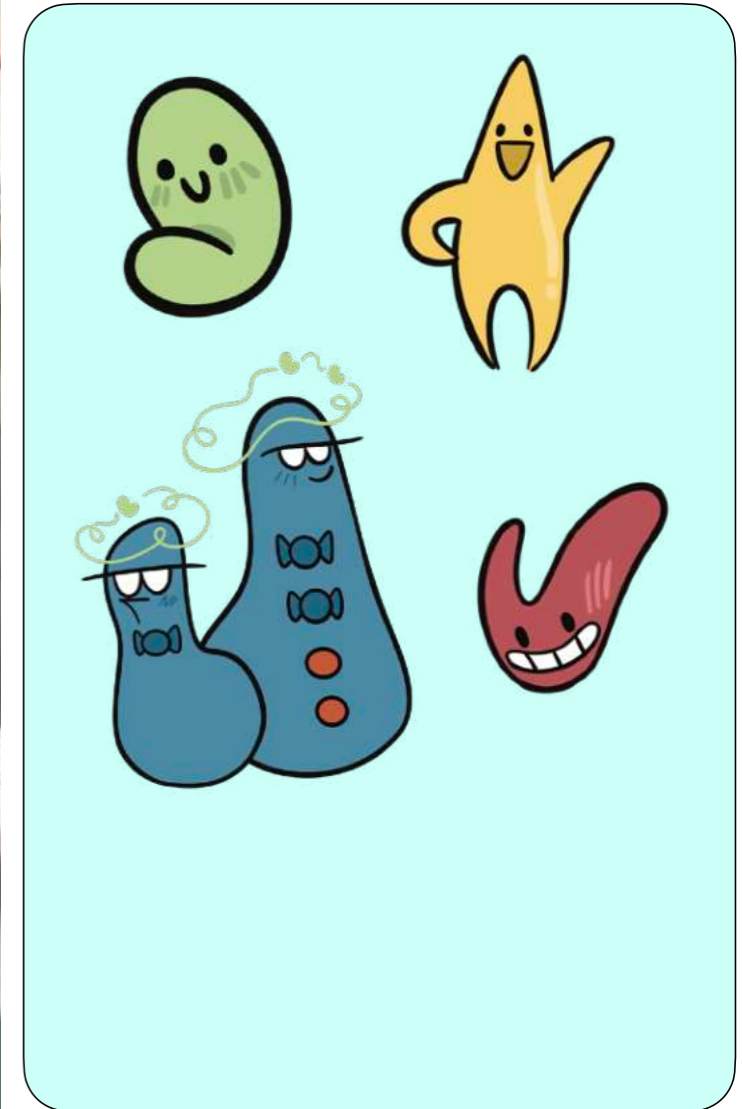
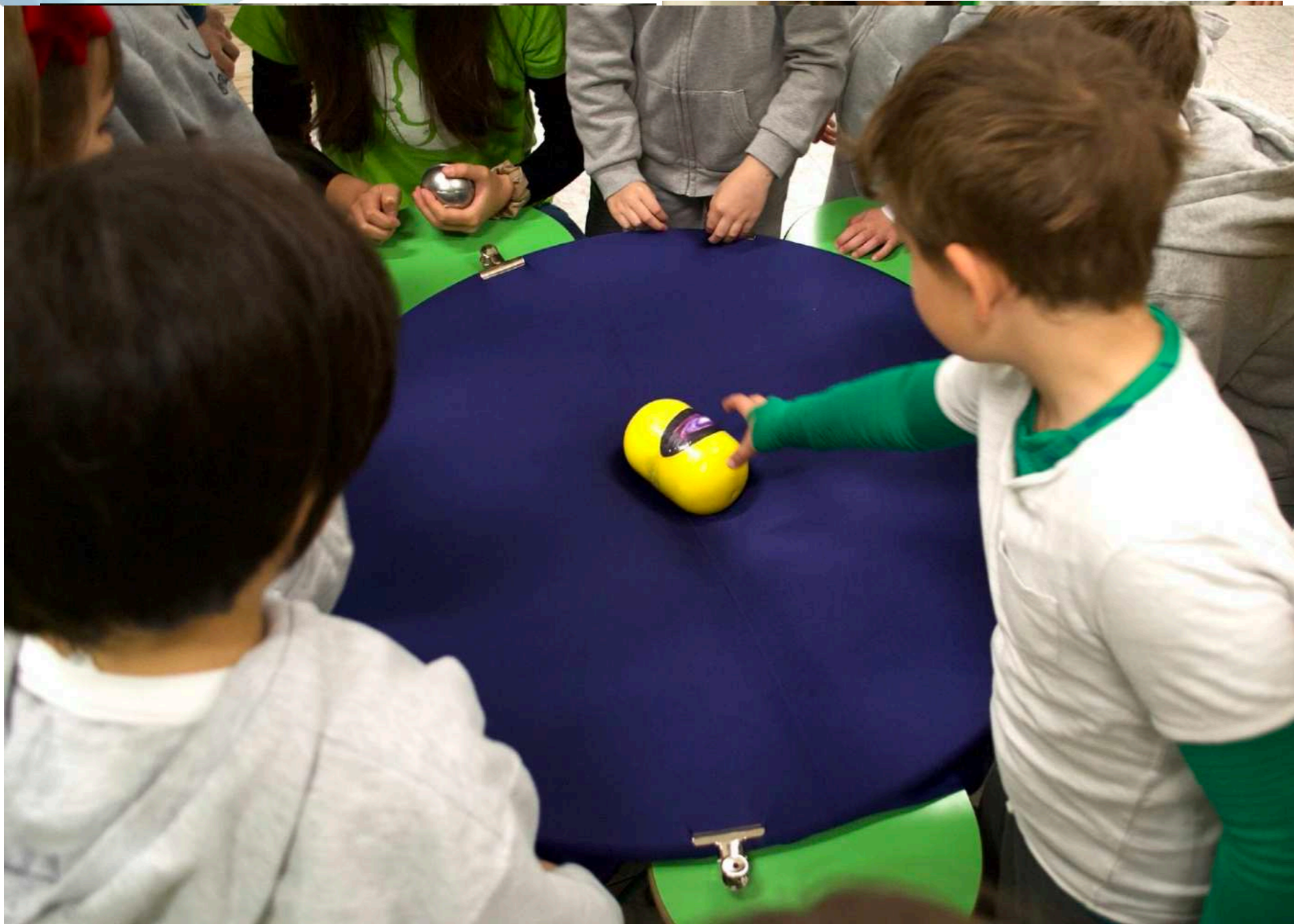


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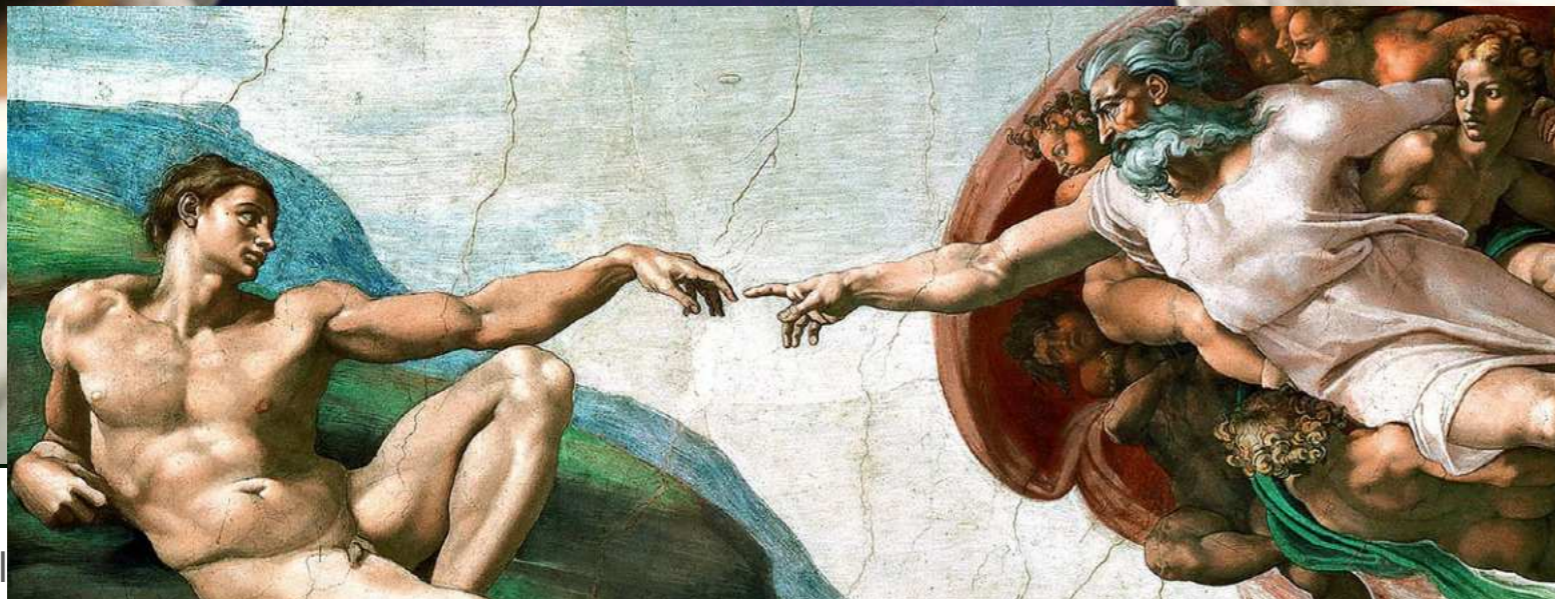
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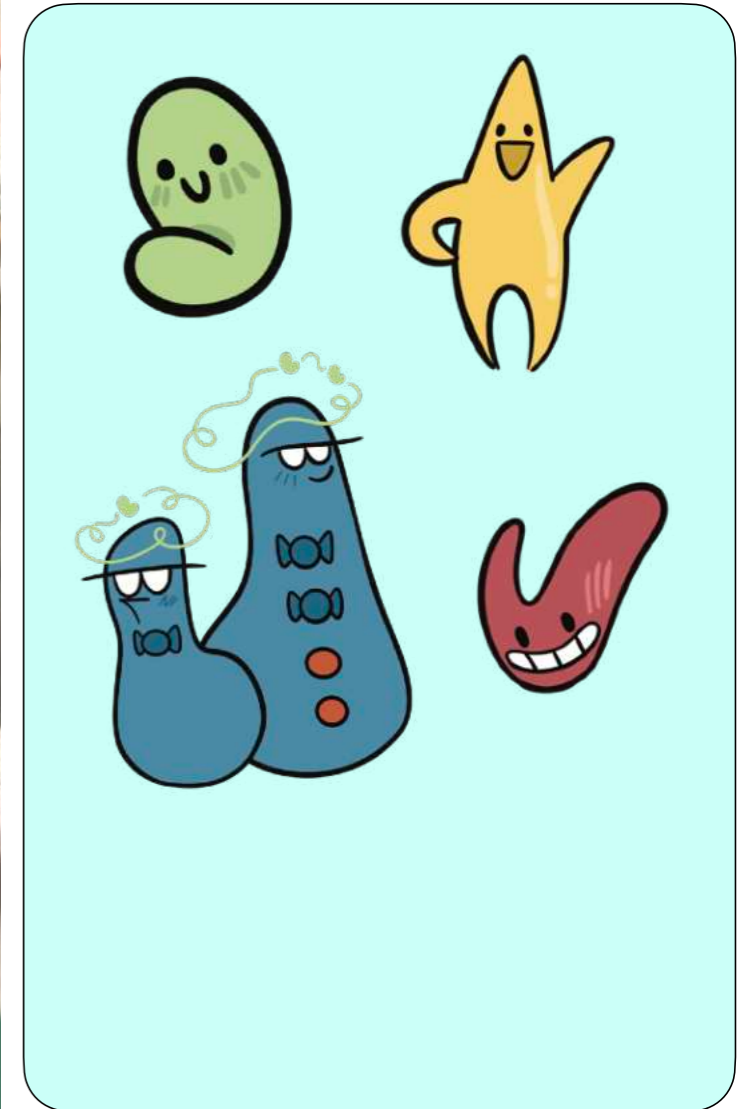
Graphic design by Gaia Fontana

## Event #2

- elementary particles
- invisible particles



Elina Merkel

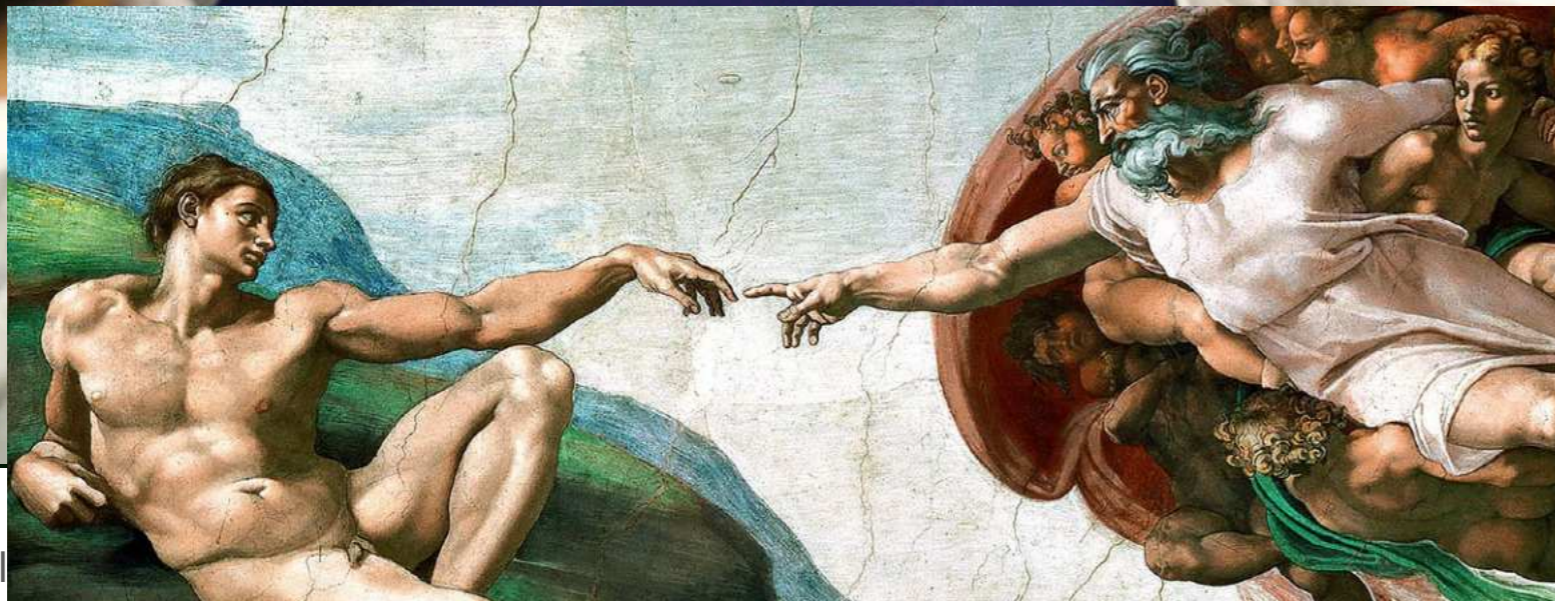


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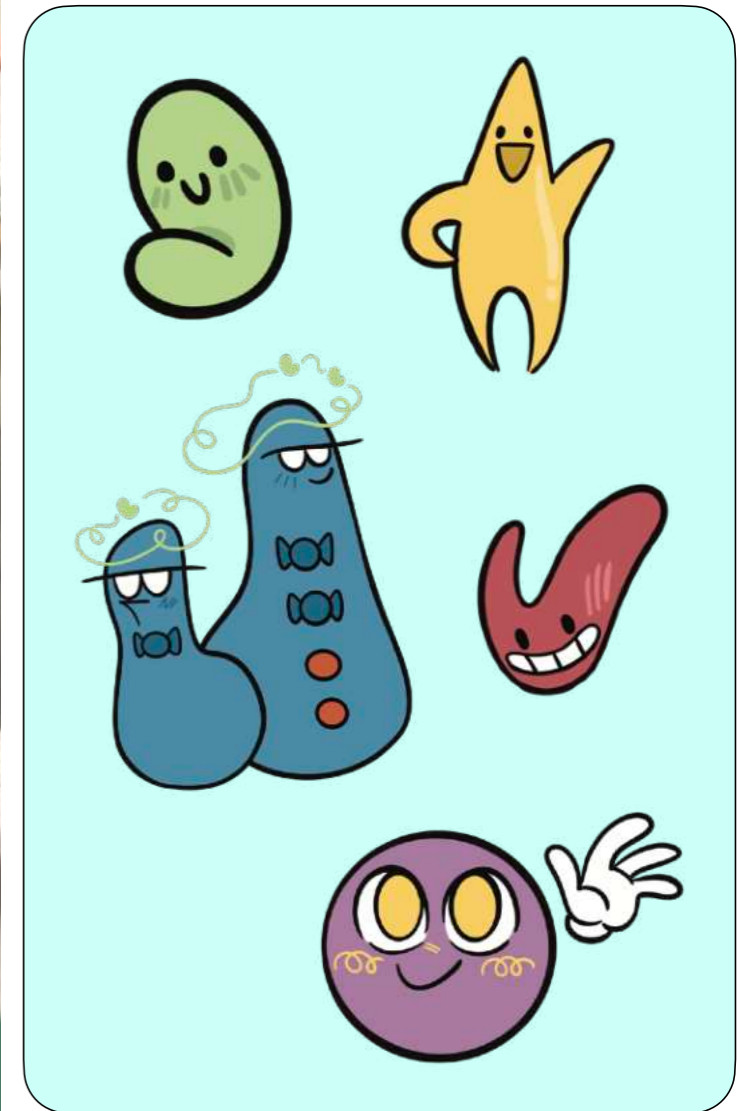


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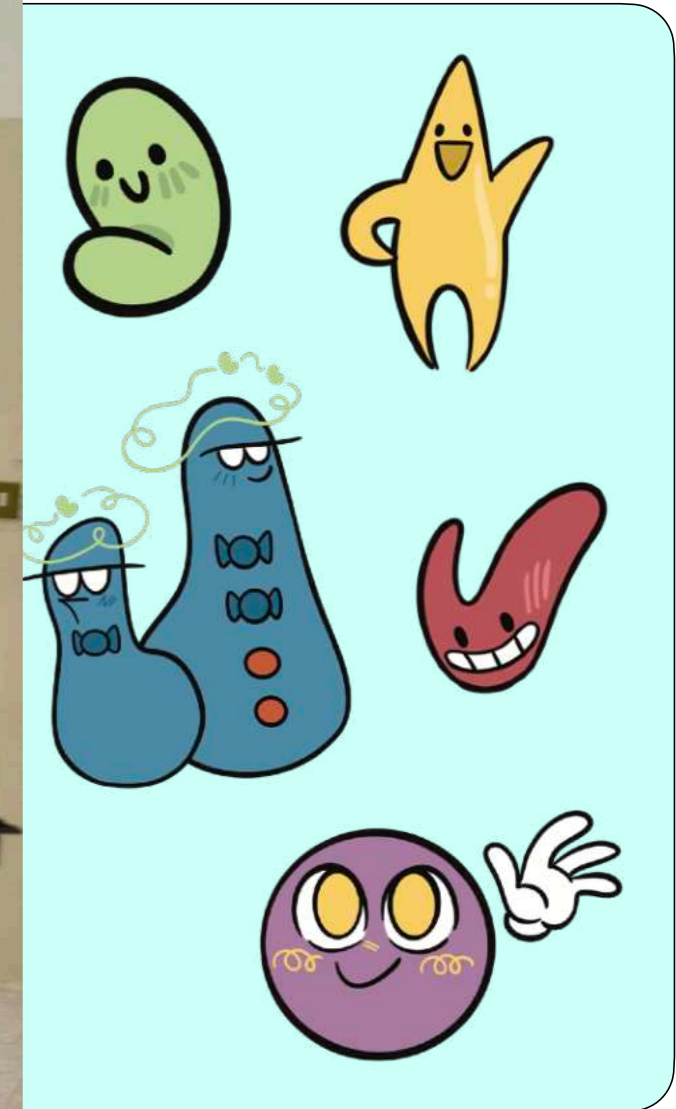
Elina Merkel



Graphic design by Gaia Fontana

## Event #2

- elementary particles
- invisible particles



Graphic design by Gaia Fontana

## Event #2

- elementary particles
- invisible particles





# Escape Room Book



in**VISIBILI**



# Escape Room Book



# Escape Room Book



inVISIBILI

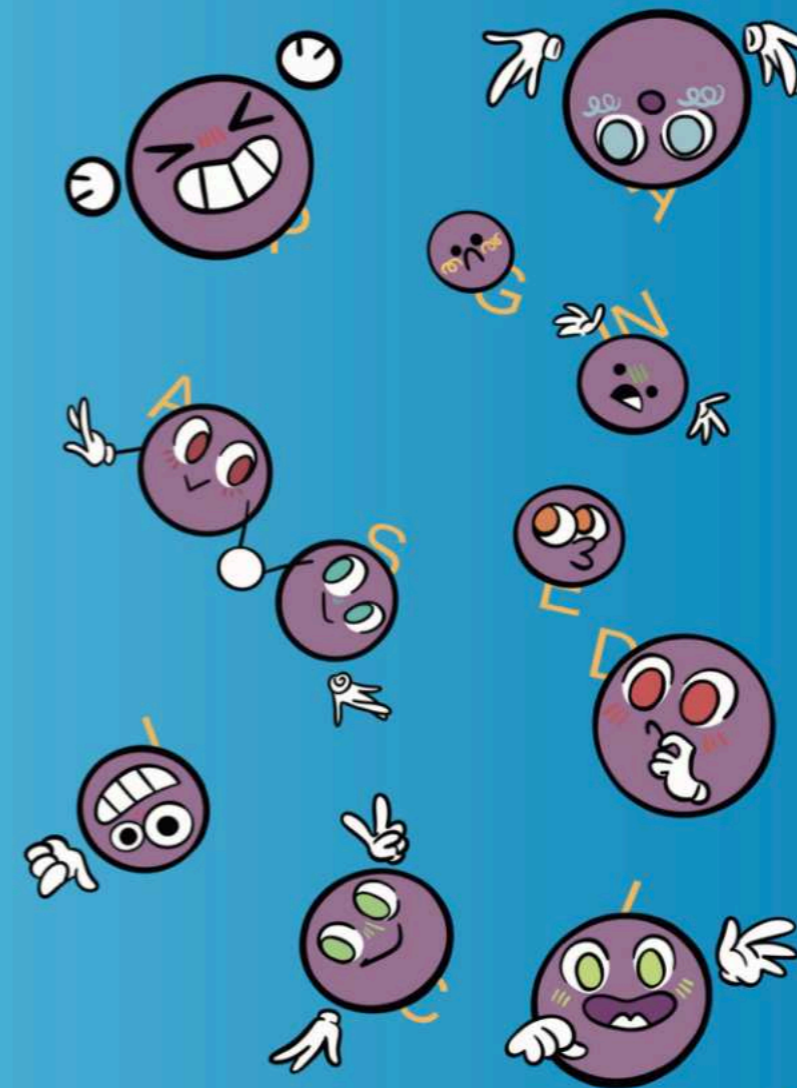
Nell'Universo primordiale Oscurina  
è un po' annoiata e si sente sola.  
Ma aspetta... Guarda!

Ci sono altre Oscurine.  
Pensi che diventeranno amiche?



Che Oscurine dispettose!  
Hanno nascosto il numero  
della prossima pagina.  
Cercalo con attenzione.

10



11

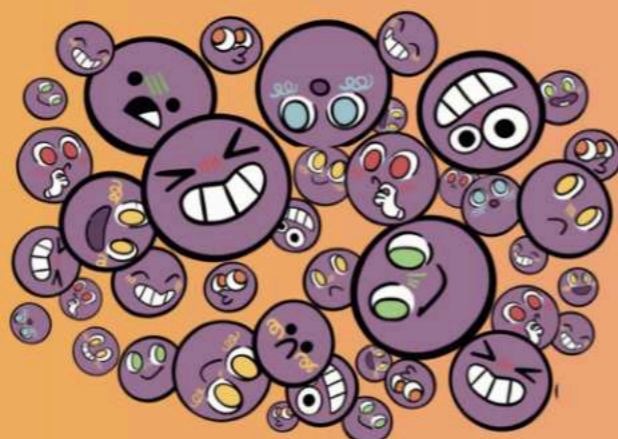


# Escape Room Book



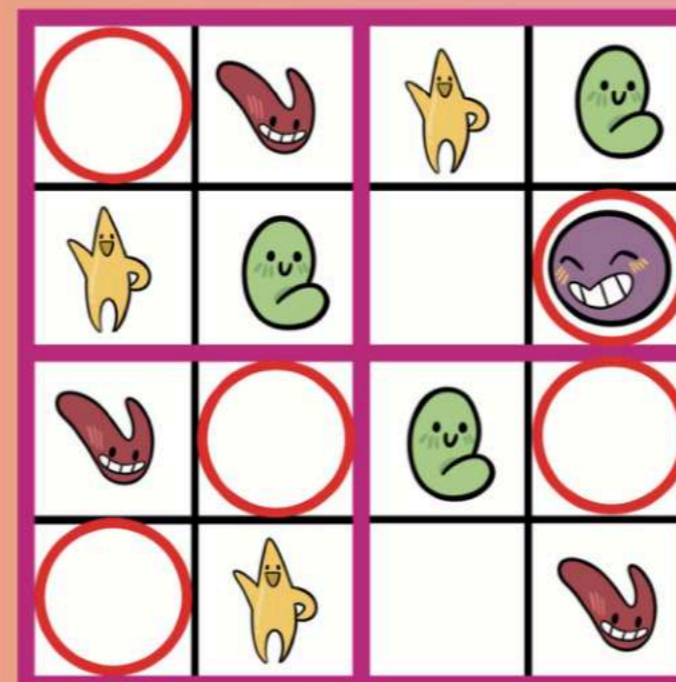
inVISIBILI


Evviva! Oscurina e le sue amiche hanno fatto una festa enorme e se ne stanno vicine vicine: una gigantesca sfera di **materia**!



Gli ammassi di materia oscura avvolgono la parte visibile delle **galassie** come un enorme **alone**.

18



 = 1    = 2    = 3    = 6

Questo è un Sudoku: ogni riga, colonna e quadrato devono contenere una sola volta ciascuna particella. Trova le particelle mancanti, la somma di quelle cerchiare ti indicherà la prossima pagina.

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# Gender biases study



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# Gender biases study



inVISIBILI

2

Prima sessione	Solo i maschi	Più i maschi che le femmine	Sia i maschi che le femmine	Più le femmine che i maschi	Solo le femmine
Secondo te, a chi piace guardare la televisione?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace giocare al parco giochi?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace mangiare i dolci?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, per chi è la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, chi è capace di fare scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

---

	Molto poco	Poco	Né poco né molto	Un po'	Molto
Quanto ti interessa la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ti piacerebbe diventare una scienziata?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pensi che a scuola sarai brava in scienze?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Gender biases study



in**VISIBILI**

Gender (hidden!)

2

Prima sessione	Solo i maschi	Più i maschi che le femmine	Sia i maschi che le femmine	Più le femmine che i maschi	Solo le femmine
Secondo te, a chi piace guardare la televisione?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace giocare al parco giochi?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace mangiare i dolci?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, per chi è la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, chi è capace di fare scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

---

	Molto poco	Poco	Né poco né molto	Un po'	Molto
Quanto ti interessa la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ti piacerebbe diventare una scienziata?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pensi che a scuola sarai brava in scienze?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>





# Gender biases study



inVISIBILI

Gender (hidden!)

Warm-up

2

Prima sessione	Solo i maschi	Più i maschi che le femmine	Sia i maschi che le femmine	Più le femmine che i maschi	Solo le femmine
Secondo te, a chi piace guardare la televisione?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace giocare al parco giochi?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace mangiare i dolci?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, per chi è la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, chi è capace di fare scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

---

	Molto poco	Poco	Né poco né molto	Un po'	Molto
Quanto ti interessa la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ti piacerebbe diventare una scienziata?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pensi che a scuola sarai brava in scienze?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



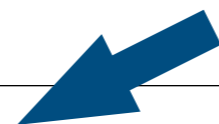


# Gender biases study



in**VISIBILI**

Gender (hidden!)



Warm-up

Science

2

Prima sessione	Solo i maschi	Più i maschi che le femmine	Sia i maschi che le femmine	Più le femmine che i maschi	Solo le femmine
Secondo te, a chi piace guardare la televisione?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace giocare al parco giochi?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace mangiare i dolci?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, per chi è la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, chi è capace di fare scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secondo te, a chi piace la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	Molto poco	Poco	Né poco né molto	Un po'	Molto
Quanto ti interessa la scienza?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ti piacerebbe diventare una scienziata?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pensi che a scuola sarai brava in scienze?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>





# Gender biases study



in**VISIBILI**

Gender (hidden!)

Warm-up

Science

2

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Boys and girls:  
 >> Ability  
 >> Category  
 >> Interest





# Gender biases study



in**VISIBILI**

Gender (hidden!)

Warm-up

Science

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Boys and girls:

>> Ability

>> Category

>> Interest

Personal interest and ability







# Feedback and results



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# Feedback and results



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## Teachers:

“New experience, significant and very well managed by experts. The children participated actively and with great interest, bringing home their experiences, which the parents made us aware of. We sincerely hope that the project can continue next year.”



# Feedback and results



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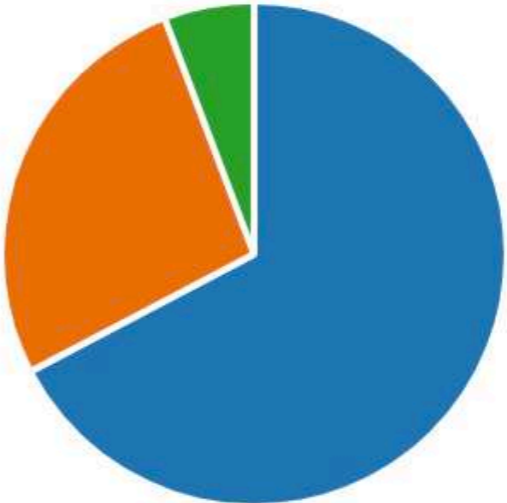
## Teachers:

5. Boys and girls spontaneously discussed what was done during the workshops even after the meetings.

[More Details](#)

 Insights

 YUP	35
 NO	14
 I DO NOT KNOW	3





# Feedback and results



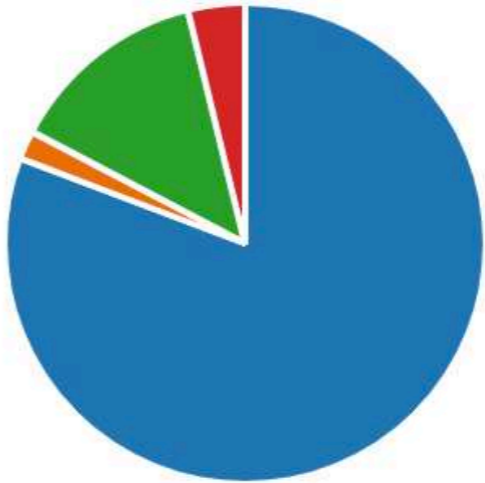
## Teachers:

8. If there was a second edition, do you think your class would be interested in participating?

[More Details](#)

 Insights

 YUP	42
 NO	1
 I DO NOT KNOW	7
 Other	2





# Feedback and results





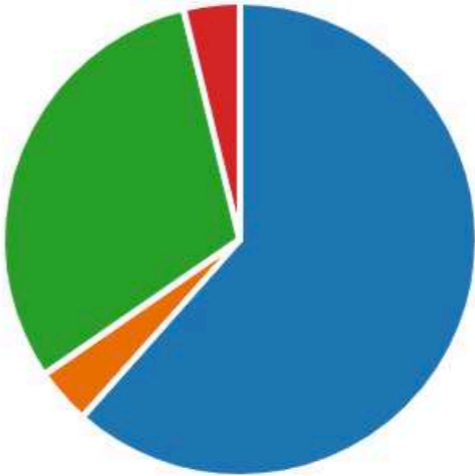
## Teachers:

10. If specific training sessions were organized for teachers, would you participate?

[More Details](#)

 Insights

 YUP	32
 NO	2
 I DO NOT KNOW	16
 Other	2





# Feedback and results





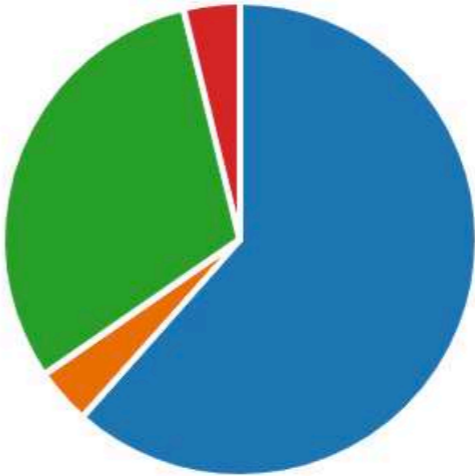
## Teachers:

10. If specific training sessions were organized for teachers, would you participate?

[More Details](#)

 Insights

 YUP	32
 NO	2
 I DO NOT KNOW	16
 Other	2



- helpful also for teachers
- continue next year
- more events than two per year!





# Feedback and results



in**VISIBILI**



# Feedback and results



## Physicists:

“... after placing the cotton galaxy (containing only ordinary matter) on the fabric of space-time, I perform the pantomime of the failed experiment's disappointment. The children widen their eyes and make funny faces. Then, in the silence of general amazement, a little voice rings out: "THERE'S SOME WEIGHT MISSING!!" (exact words!!)”



# Feedback and results



## Physicists:

“... after placing the cotton galaxy (containing only ordinary matter) on the fabric of space-time, I perform the pantomime of the failed experiment's disappointment. The children widen their eyes and make funny faces. Then, in the silence of general amazement, a little voice rings out: "THERE'S SOME WEIGHT MISSING!!" (exact words!!)”

“Exhausting, but extremely fun!!! :-)”



# Feedback and results

## Gender stereotypes (preliminary) :





# Feedback and results

Gender stereotypes (preliminary) :



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**Who do you think science is for?**





# Feedback and results

Gender stereotypes (preliminary) :



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**Who do you think science is for?**

~ 400 children in total  
7-11 y.o.





# Feedback and results

## Gender stereotypes (preliminary) :

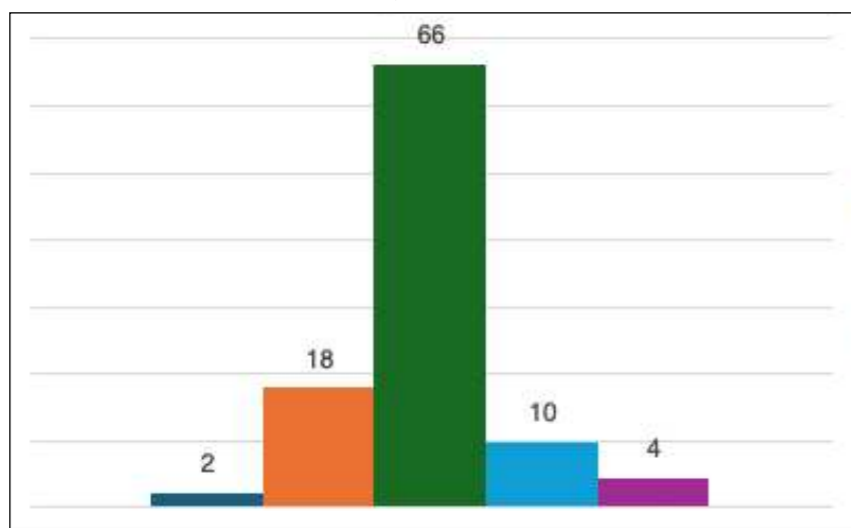


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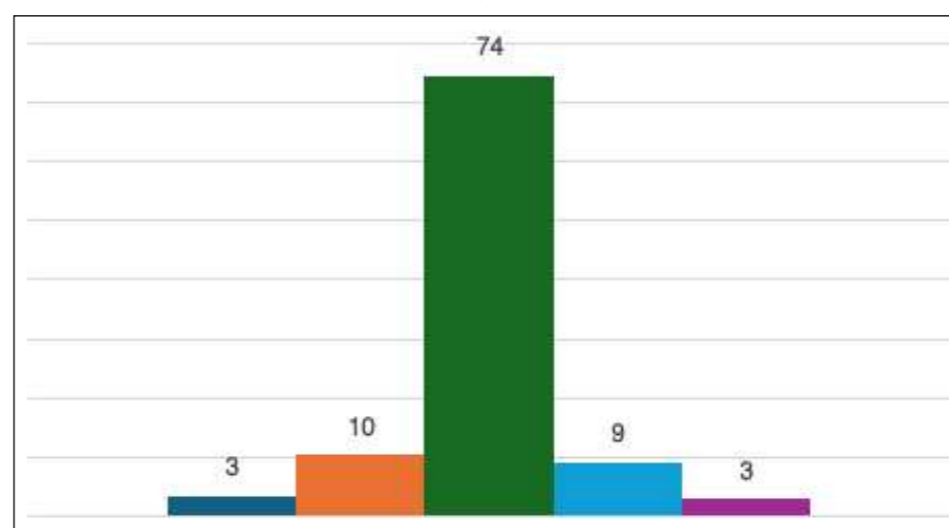
~ 400 children in total  
7-11 y.o.

### “Who do you think science is for?”

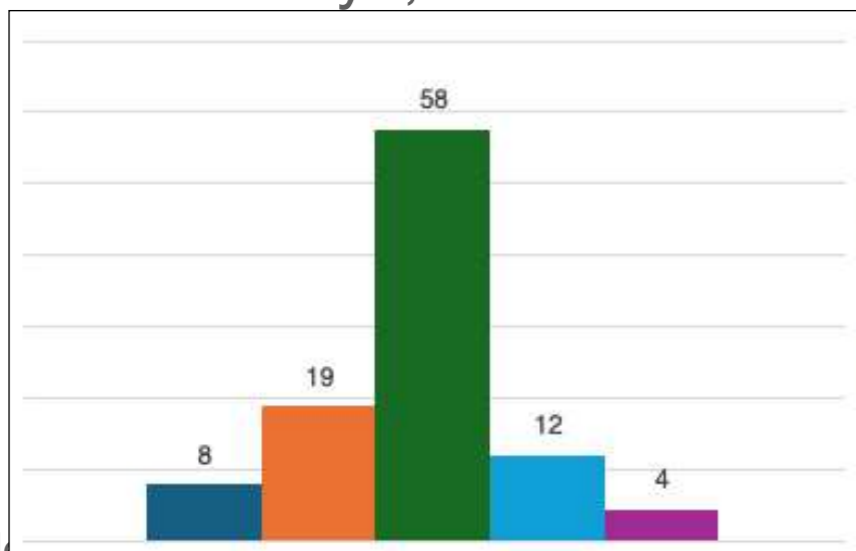
Girls, before



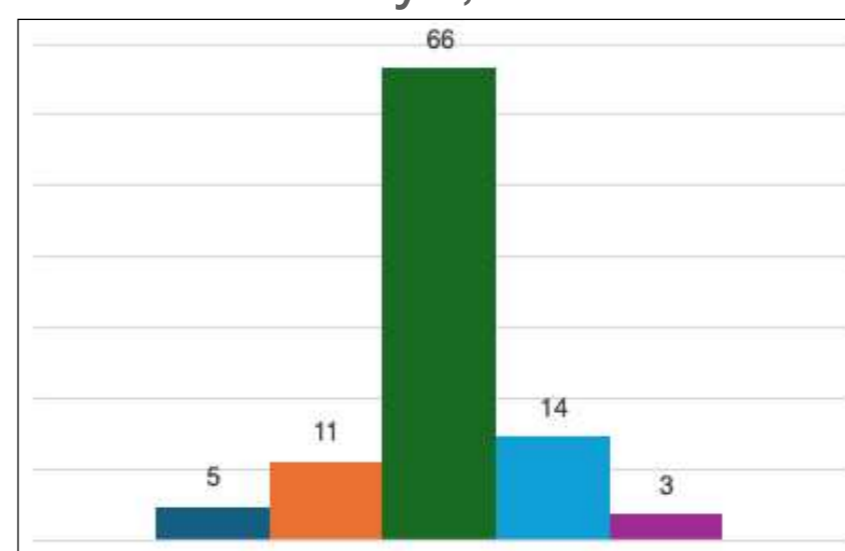
Girls, after



Boys, before



Boys, after



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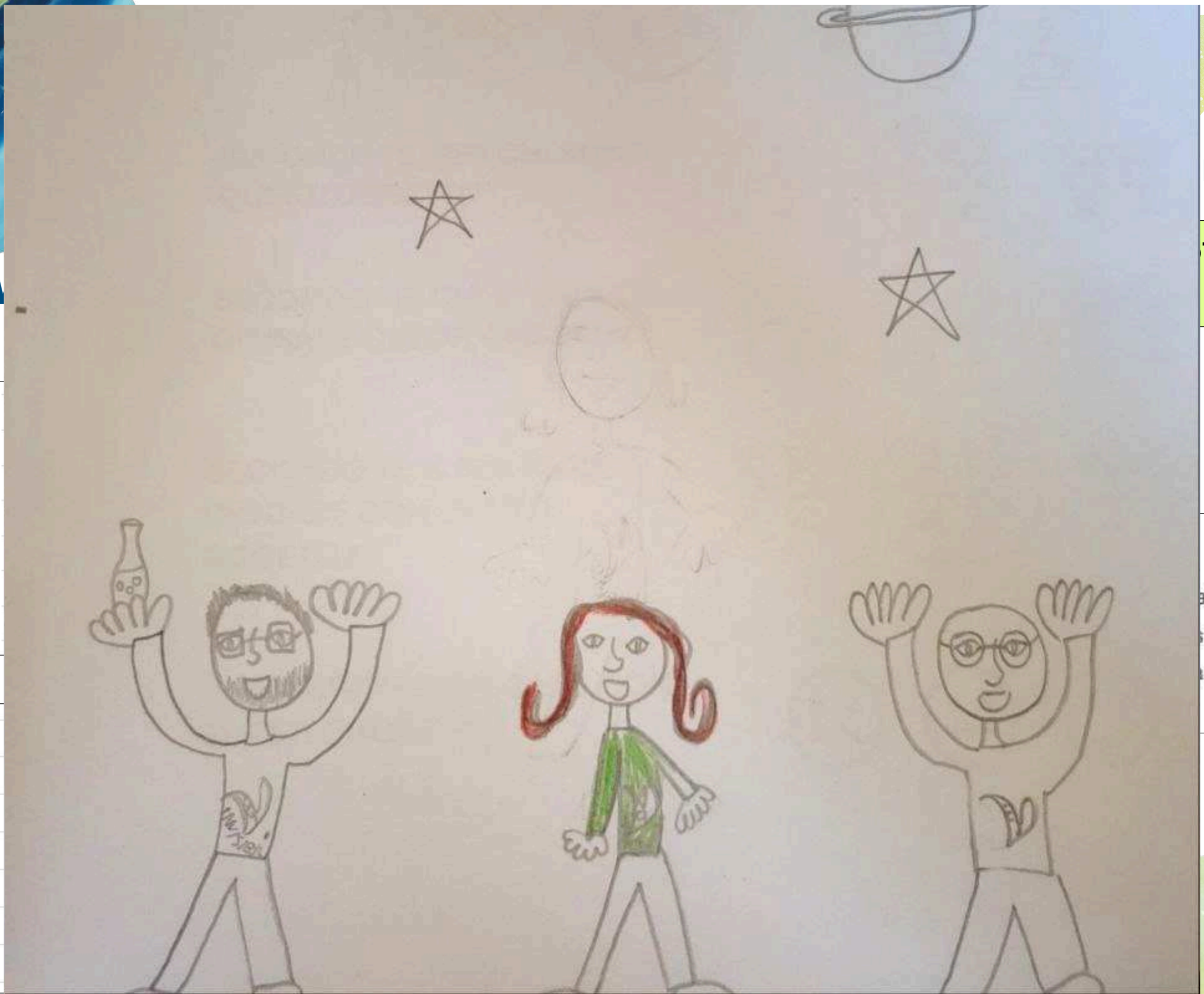




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# Summary and Takeaways



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# Summary and Takeaways



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Outreach for young children is important!



# Summary and Takeaways



Outreach for young children is important!

Outreach for young children is impactful!

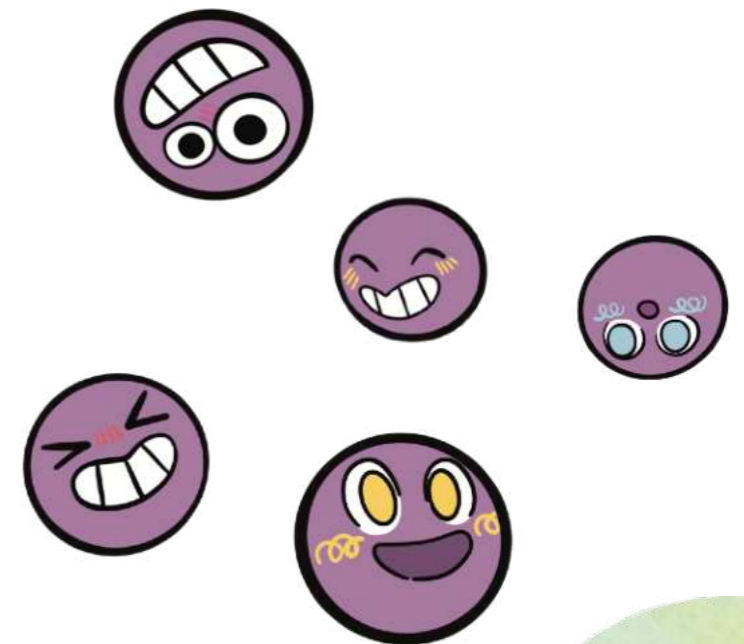
# Summary and Takeaways



Outreach for young children is important!

Outreach for young children is impactful!

Outreach for young children is fun!





**... one last thing**



**inVISIBILI**

**We are looking for  
collaborations with other  
institutions!**

**Contact us!**





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**Thank you for your attention!**

[elina.merkel@unibo.it](mailto:elina.merkel@unibo.it)