How to get a water drop levitating

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2 ways

- optical illusion
- real levitation (gravity compensation)

Optical Illusion 1 : Change frame reference

In mechanics, all is about frame reference.
The water drop has to levitate from the observer's point of view

frame reference Référentiel

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Drop the observer and the water drop at once !

If he falls as rapidly as the water, from his point of view, the drop will levitate.

frame reference Référentiel

Optical Illusion 2 : Stroboscopic Light FTW !

Main improvement : far less dangerous than the previous one.

dropwise	Goutte à goutte
POV	Persistance of Vision
phase shift	Décalage de phase, déphasage

Optical Illusion 2 : Stroboscopic Light FTW !

Main improvement : far less dangerous than the previous one.

Use a regular dropwise and a stroboscopic light at the same frequency (quite a bit dephased).
The observer will see drops in air as if they were floating.

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This process use the POV phenomenon. A modification of the strob phase shift makes the drops go up and down.

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Real Levitation

Core concept :

Compensate the gravity field's action

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In optical illusions, we used gravity to achieve our goals, now...

Let's fight against it !

Real Levitation : 3 ways

- Weighlessness
- Supraconductors
- Acoustic Levitation

Real Levitation 1 : Weightlessness

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weighlessness Apesanteur

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weighlessness Apesanteur

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In a spatial station, speed and distance make Earth's gravity field really weak.
In a parabolic flight, the aircraft acceleration is greater than the gravity constant, so materials inside are not under its control anymore.

weighlessness Apesanteur

Real Levitation 2 : Supraconductors

Combination of :

- Extreme power of supraconductor magnet
- Diamagnetic properties of water

What's a Diagmagnetic material

Damagnetism is the property of an object or material which causes it to create a magnetic field in opposition to an externally applied magnetic field.

Wikipedia

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> *Damagnetism is the property of an object or material which causes it to create a magnetic field in opposition to an externally applied magnetic field.*
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> Wikipedia

If you apply a strong magnetic field to a water drop, the drop will create a opposite field.

The two magnetic forces are opposite so the drop (or any object containing a lot of water) will levitate.

Real Levitation 3 : Acoustic Levitation

Acoustics describes waves through fluid, gases or solids.

These waves affect the material in which they "travel", creating pressure and speed differences.

Using some particular waves, it's possible to create pressure "steps".

Real Levitation 3 : Acoustic Levitation

The most powerful example : stationnary waves which create nodes and anti-nodes of pressure.

Each node is like a pressure step where you can "put" objects like a water drop.

pressure nodes noeud de pression (zone de faible pression absolue)

pressure anti-nodes ventre de pression (zone de forte pression absolue)