PROJECT : PLANT AIR PURIFIER / INDOOR AIR QUALITY REMEDIATION KIT

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Christophe GUÉRIN, designer & research student EnsadLab.

Collaboration : Nick SHAPIRO, Liz BARRY, Bronwen DENSMORE, Jeffrey WARREN, Claude YEPREMIAN.



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Project:
Creating a DIY indoor air quality remediation kit

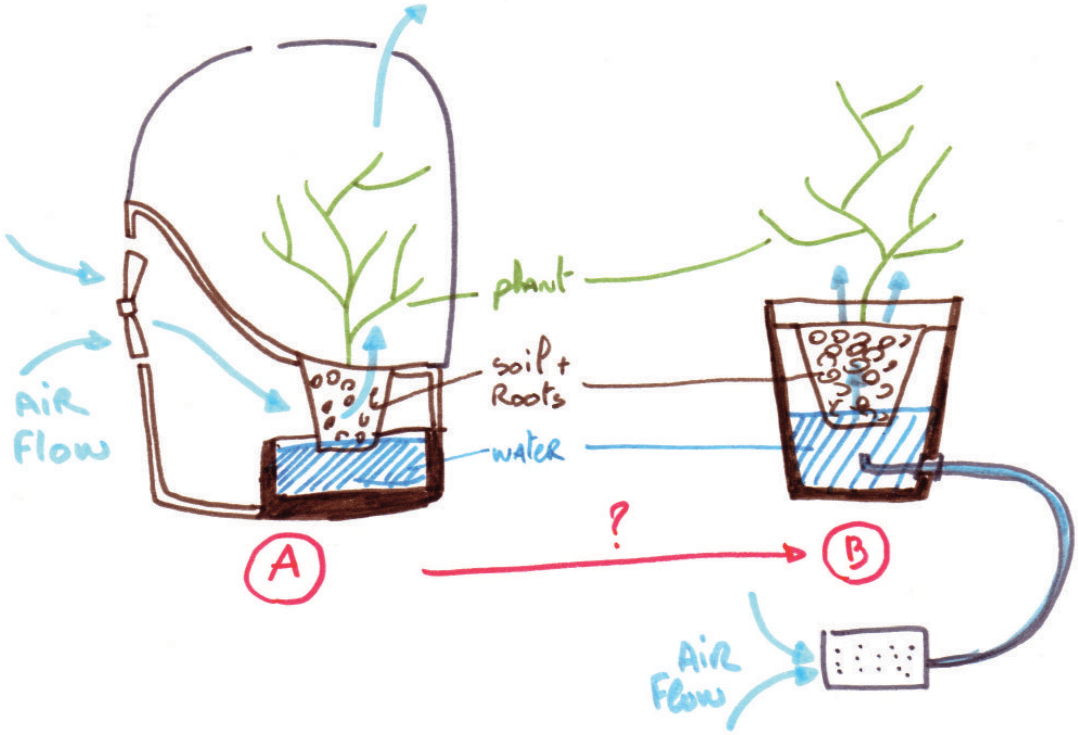
I first met Nick SHAPIRO during, international seminar *« Humanités Médicales» USPC Program « La Personne en médecine », « Environnements toxiques » with Soraya Boudia (Paris-Descartes University - CERMES 3), Nick Shapiro (anthropology, Chemical Heritage Foundation, Matter and Materials Research Group), Natasha Myers (anthropology, York University) and collectif Toxic Tour Detox 93.*
We spoke about Formaldehyde molecules, because air pollution is one of my research subjects. He said that he has an ongoing project, based on plants air purifiers, with Public Lab. He asked me if I could be interested in that project and my answer was yes, I do.
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CONFIDENTIAL

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Understanding

Before going into the design project, I first need to understand how does it work, how can we improve what is already existing?



Mathieu LEHANNEUR concept VS new pump concept.

My first email :
I want to know the difference between what is existing already, designed by Mathieu Lehanneur and what you want to do? I don't understand why using an air pump will be more efficient than a fan?

Nick Answer:
(...) The fan is high volume but low pressure and Lehanneur's design use fans and regular soil. I think the low pressure fan combined with the regular soil (as opposed to hydroculture growth media with losts of space between pebbles that aid airflow) that is packed tightly means that the air does not flow through the rhizosphere (the area of the roots that host the bacteria that do most of the remediating). The air just can't force its way throught the system at that pressure. The fundamental limmitation of this system is diffusion (air circulation) and not the metabolism of the bacteria, so designing around maximum air flow seems key to me (...)

Ok, if I resume :

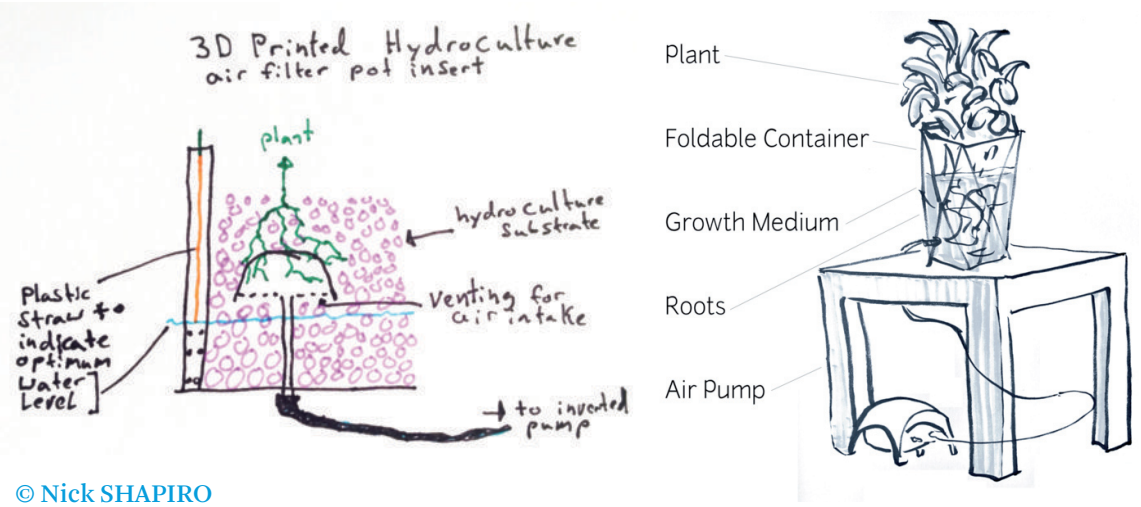
- hydroculture growth media = aids airflow
- Pump = better or higher pressure than a fan.

In addition I understood that my drawing is wrong, because air flow won't circulate that way and neither go throught water (cf.Nick clarifications) :

Two small clarifications on b is that

- 1) the airflow is opposite we reverse the air flow in the pump to suck air in. My worry is that pumping air our through the growth medium could resuspend particulate matter from the dusty hydroculture growth medium and also because that is what wolverton recoments and he spent decades of his life only thinking about that so there might be other reasons. One arguement to keep it a pump is that many toxicants are heavier than air so if we had the pump down low we might be able to destroy more toxicants even if the plant was up on a window sill

- 2) as our pump becomes a vacuum the inlet nozel would be above the waterline. Designing around making the waterline and the air inlet level visible seems improtant so we don't let people accidently kill their vacuum by sucking water into it. Here is a sketch i did 3 years ago that may or may not be helpful.



© Nick SHAPIRO
© Jeffrey WARREN

I resume:

- The pump is sucking the air and pushing it into the plant pot.
The negative part is that using hydroculture growth media might bring more pollution in the air (room air).
The positive part, as the pump is not fixed to the plant, you can place it on the floor where most toxic molecules are.

- If I well understood, your pump push the air into the plant pot but it can sometimes suck the air too. So in that case, the air can't go through the water.

One more question from the Public Lab:

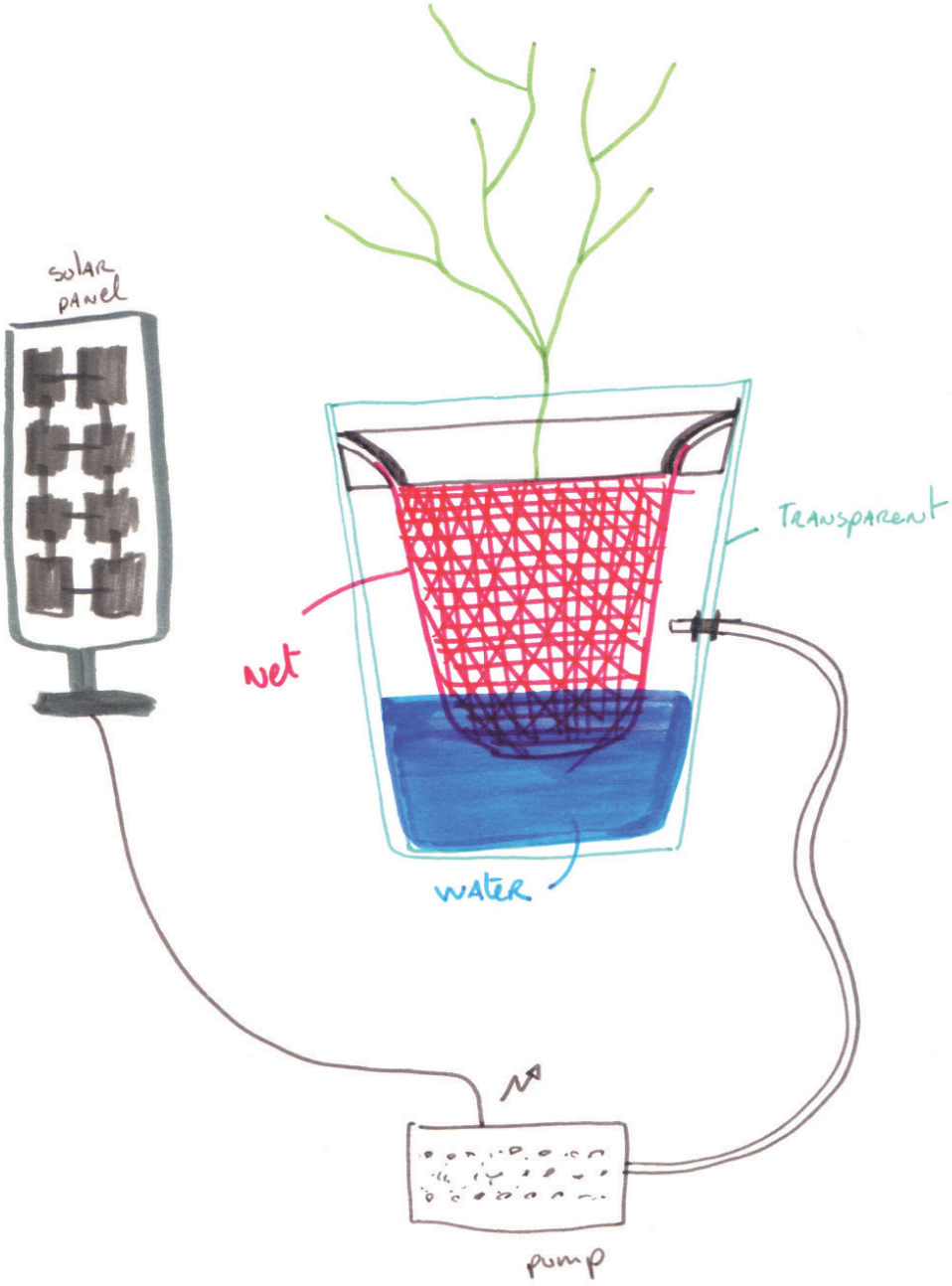
Why should we do activated carbon bath for hydroculture growth media?

About design process:

- Collecting polluted air, on the one hand, and growing the plant, on the other hand, in two different locations, has a huge impact on the design. We could design two kinds of products. First one is a separate function for small plants, and the second product is 'all in one function', for big plants staying and growing on the floor.

CONCEPT

Here I tried to add all needs in one drawing as design concept purpose, coming from what you allreday tried and what you expect.

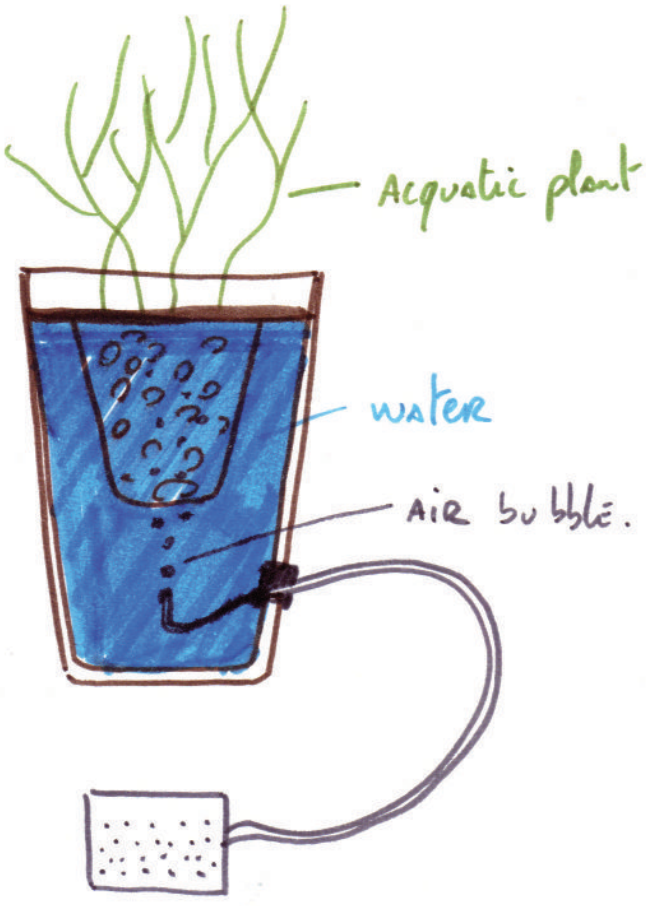


Design concept
© Christophe GUÉRIN

- A transparent pot = water level
- A flexible, foldable pot = easy to transport
- A flexible hydroculture growth media net container = easy to transport / Lightweight/
- A pump separate from the pot = collecting pollution on the floor
- A Solar panel = electricity for the pump and programming system
- An air injection higher than water level = push and suck airflow

Open thought

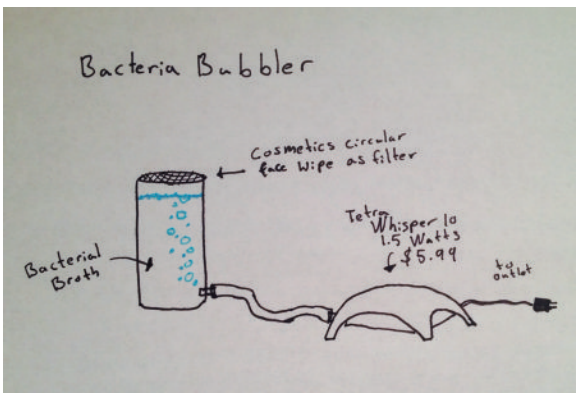
Does the air going through the water will make a difference? Do you think we could use acquatic plants ?



Acquatic plant design concept.
© Christophe GUÉRIN

Nick quote :
This is interesting! I wonder if aquatic plants also cultivate a large bacterial colony in the water or if an aquatic plant could support bacterial colony growth through root exudates that we added. We've been thinking about using the bacteria that are used in waste water treatment and bubbling air through that, but the problem of keeping the bacteria alive is tricky. maybe an aquatic plant is the soloution? here's the first note on this.

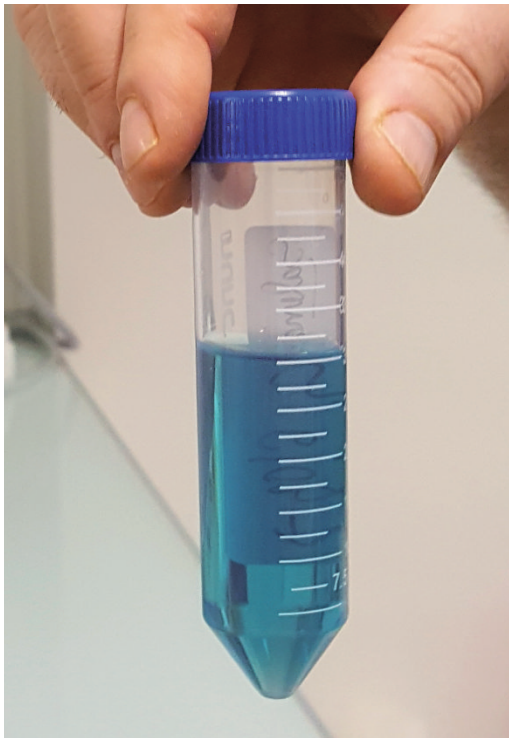
© Nick SHAPIRO




Standardbeleuchtung
standard luminous intensity
Standardbeleuchtung
standard luminous intensity

MEETING

I met a french scientist, CLAUDE YÉPRÉMIAN, specialized in algae field. I asked him if we could create an ecosystem where algae would be the substrate of plant.





CLAUDE YÉPRÉMIAN
Responsable de l'Algothèque ALCP/PMC
WDCM 792
https://www.mnhn.fr/fr/collections/ensembles-collections/ressources-biologiques-cellules-vivantes-cryoconservees/microalgues-cyanobacteries
UMR 7245 CNRS «Molécules de Communication et Adaptation des Microorganismes» (MCAM)
USM505 «Cyanobactéries, Cyanotoxines et Environnement» (CCE)
Département «Adaptations du Vivant» (Aviv)
Muséum National d'Histoire Naturelle (MNHN)
12, rue Buffon
75005 PARIS - FRANCE

I was impressed about algae. There are so many algae colours!
We can grow pink, blue, green, purple and red algae. They are living plant organisms, working with photosynthesis, so consuming CO2 and transforming it into oxygen.

I asked Claude if we could grow algae in a transparent pot and use them as a substrate for aquatic plants or classical plants?

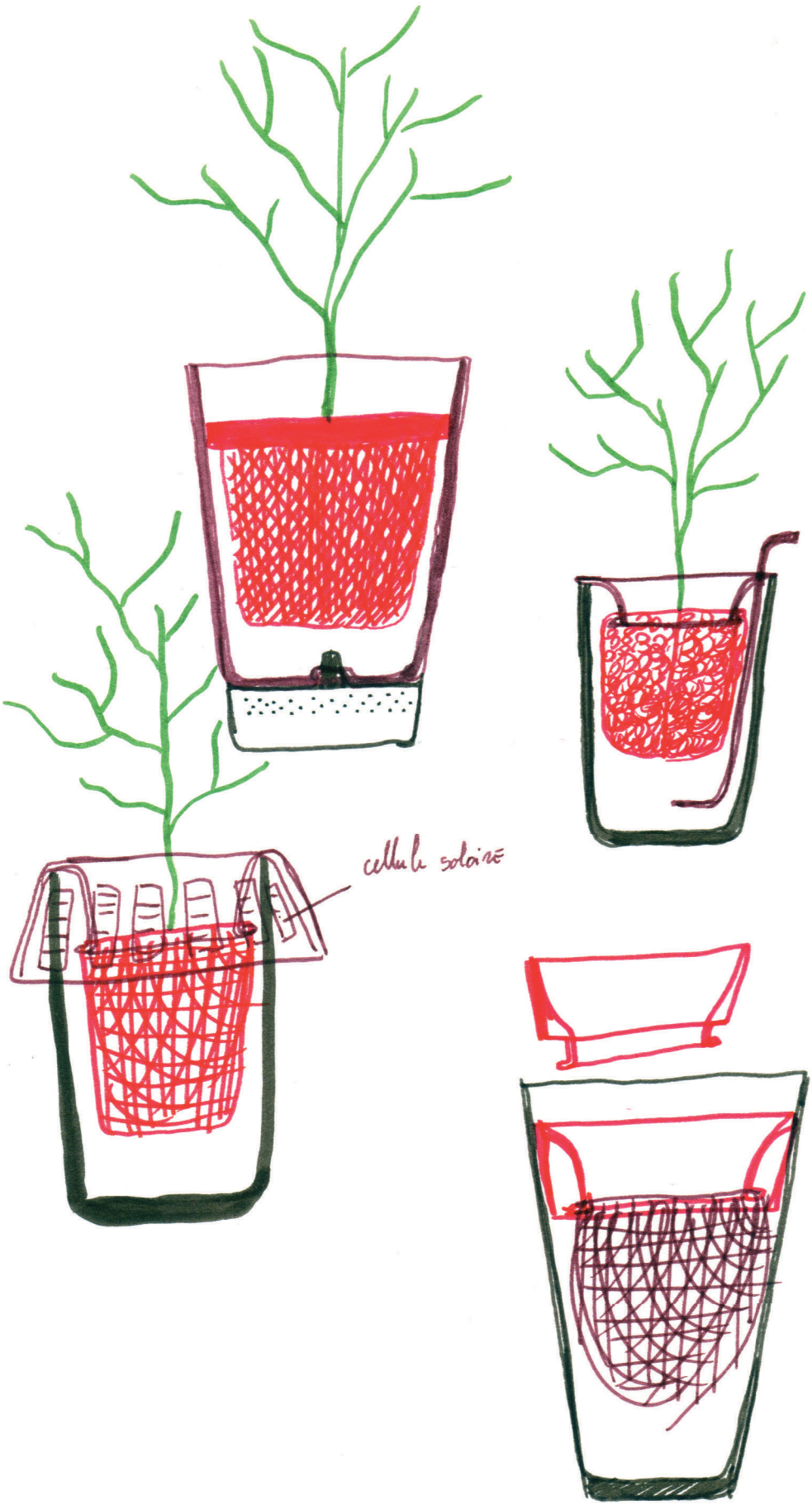
He said that algae and plants could live together. There will be a competition between them, so we must take care of maximising airflow and sunlight, to feed them all. However, he doesn't know which is the right combination between , algae and plants. He asked to find an 'upper' plant physiologist, to know more about it.
We can start doing experimentation. He said that he would be more than happy to give us algae

Then I asked him if algae could 'consume' formaldehyde?

He said that if we can transform formaldehyde into a solid form, living organisms should digest it.

INSPIRATION

I first started doing sketches and drawings about coloured combinations and poetics objects. This is a first rough and none of them are fully functional. This stage is more about finding the right spirit of the object.


cellule solaire
CG
30/04/2014


CG
01/05/2017



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CG
01/03/2017



CG
01/05/2017



CL
01/05/2017

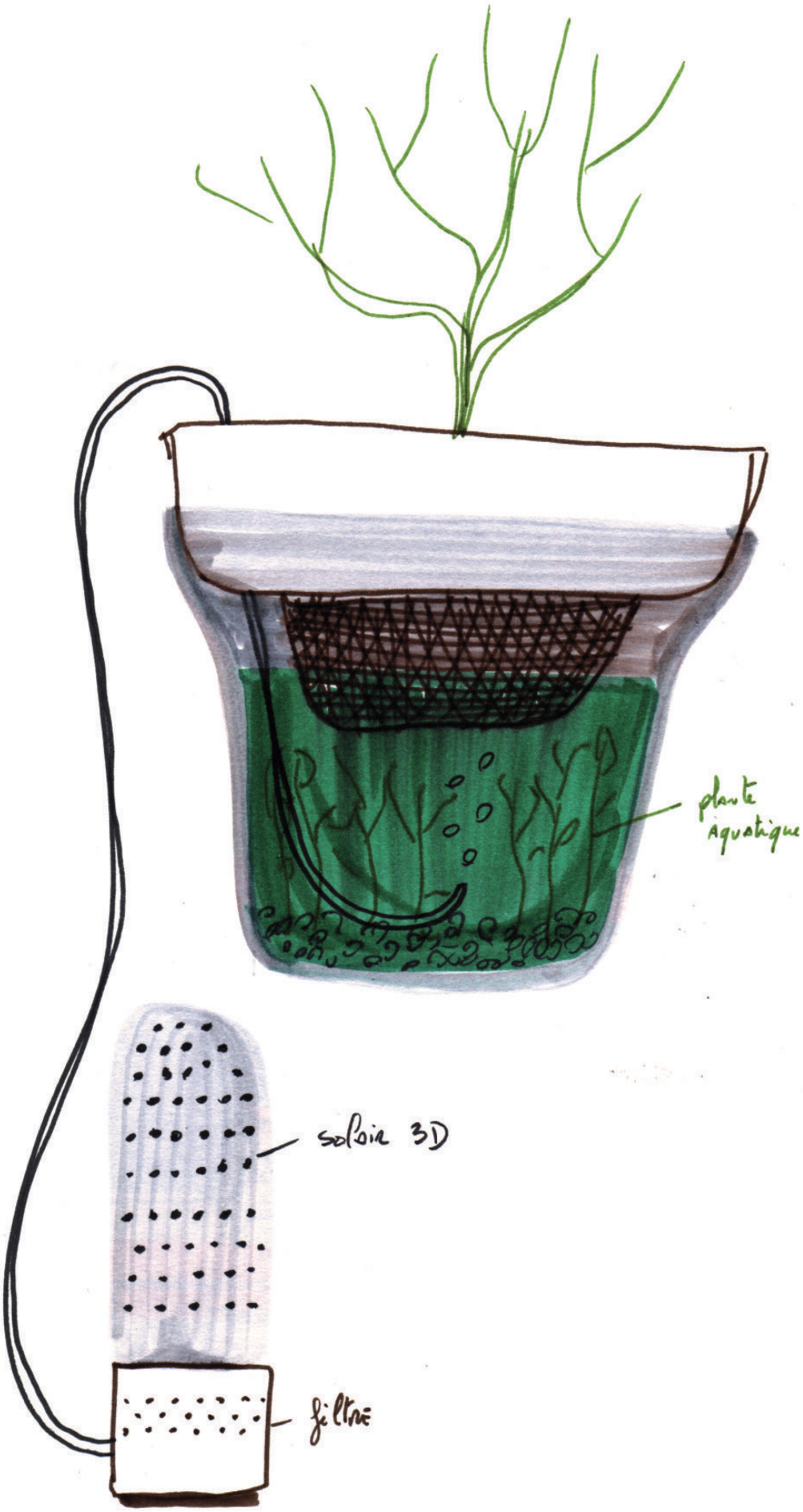


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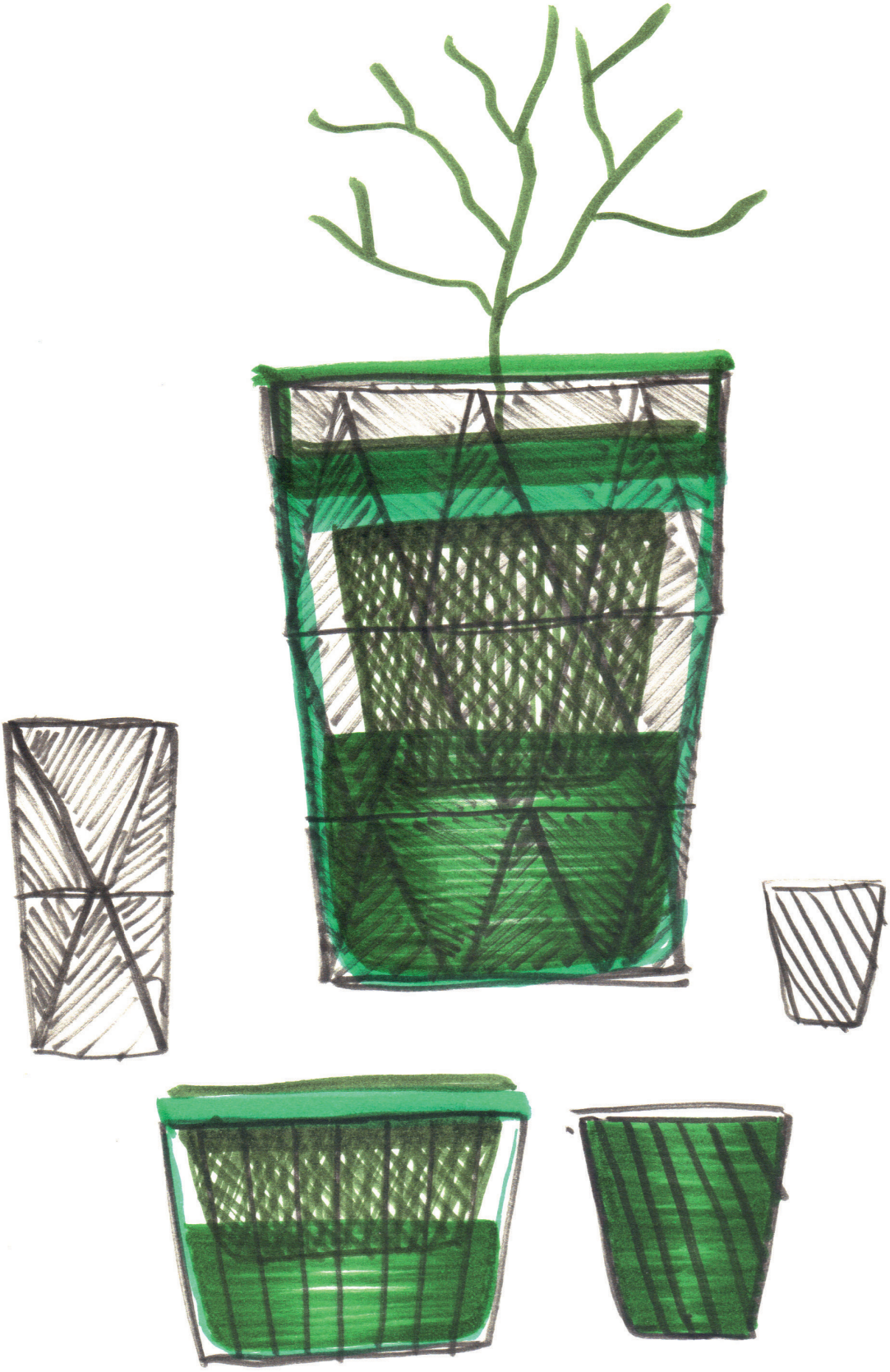


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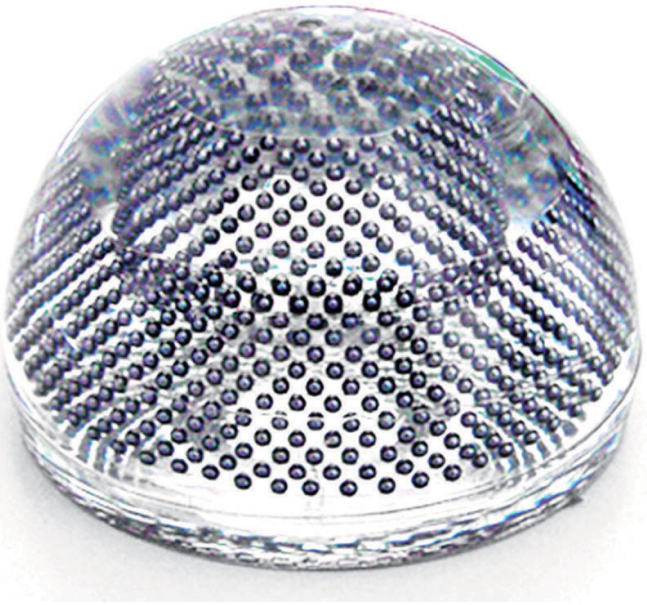
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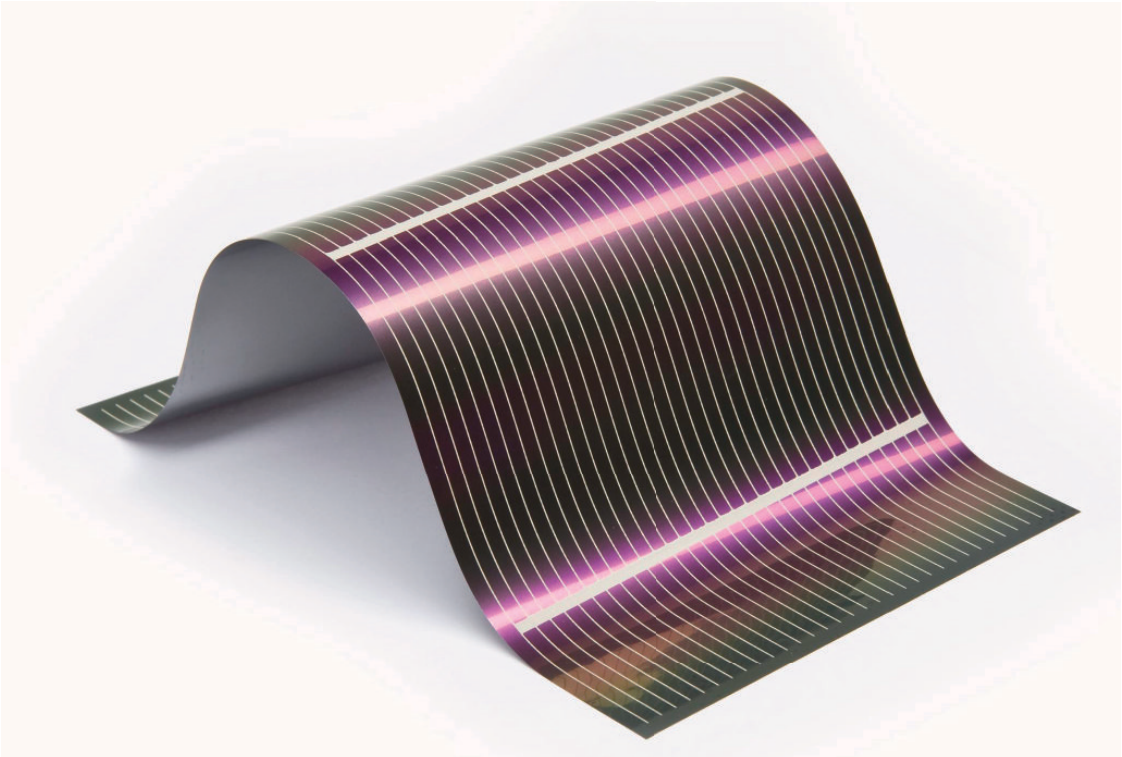
13/05/2017

TECHNO

Here are two different ways of collecting energy from the sun.



Sphelar
kyosemi.co.jp



Soft solar panel