198 teams from around the world have registered for the 2014 Challenge. From University of Oviedo: to form a multidisciplinary team

**AULAECO TEAM**
- 3 Engineers
- 1 Biologist
- 1 Biotechnologist
- 1 Architect

Ramón Rubio - PhD Engineer
Team Advisor

Marlen López - Architect
Team Manager

Álvaro Fuego
Biologist

Laura Meléndez
Mechanical Engineer

Verónica Olmos
Biotechnologist

Marta Panizo
Mechanical Engineer

**CHALLENGE THEME**
Examine how nature facilitates effective and efficient transportation
Apply a biomimicry design process to a transportation challenge that addresses one or both of the following needs

**OPPORTUNITIES TO IMPROVE**
Make public transit, freight or individual transportation options (excluding cars), more responsive to user needs.
Reduce the environmental impact of any form of transportation.

**ACCESSIBILITY - SECURITY - COMFORT - FLEXIBILITY**
**ENERGY USE - GHG EMISSIONS - URBAN HEAT ISLAND EFFECTS - MATERIAL NEED WASTE - POLLUTION - NEGATIVE EFFECTS ON BIODIVERSITY**

**NATURE-INSPIRED TRANSPORTATION PROJECT**
COMECEO
COMECCO
Reducing the environmental impact of transportation

ABSTRACT

People depend on transportation for their everyday tasks. As a reduction of this dependency is difficult to integrate in the current social way of life, an interesting point of view is thinking about getting transportation conditions improved and be more respectful with the environment.

Pollution reports about the situation in Gijón seem to indicate that there are some “hot points” acting as spotlights of contaminating gases. When crossing this information with the data provided by other similar reports, it looks like CO2 production is an important problem in this region.

CHALLENGE THEME AND OPPORTUNITIES TO IMPROVE

Reduce the environmental impact of any form of transportation. This may include aspects of energy use, ghg emissions, urban heat island effects, material need/waste, pollution, and/or negative effects on biodiversity.

WITH ALL THIS PROBLEMS IN MIND, THE BRAINSTORMING STARTED: WHAT IF WE HAVE A LOOK AT THE NATURE?

Plants and other photosynthetic organisms can make an efficient use of environmental CO2. Also, sea urchins seem to have a mechanism nickel-nano-particles-mediated to somehow “convert” CO2 in calcium carbonate (also called chalk). This was the main source of natural ideas to start ComeCOO: maybe it is not necessary to avoid transportation … but what if we can turn things into a more “eco-friendly” solution?

Other important key source inspiring this project was a combination of fungi and plants that respond to specific stimuli. The fungus Phallus indusiatus has a structure called indusium which acted as a major inspiration for the design of a CO2 absorbing net in ComeCOO. In addition, to get the project more integrated into the urban environment, a crucial point was thinking about the plants Mimosa pudica and Oxalis triangularis. These plants present nastic movements, non-directional responses to certain stimuli.

The same strategy followed by ComeCOO: it experiments its highest efficiency when responding to stimuli related to important CO2 concentration values.

The result of all this hard work was the prototype of a device with a low urbanistic impact able to reduce CO2 concentration levels in the “hot points” of Gijón.
**COMECOO**
Reducing the environmental impact of transportation

**BIOLOGICAL STRATEGIES CONSIDERED**

**TYPE 1**  
**ORGANISMS ABSORBING CO2**

*Echinus melo**

**TYPE 2**  
**ORGANISMS WITH INSPIRING SHAPE**

*Phallus indusiatus, Amanita muscaria**

*Oxalis triangularis*

**TYPE 3**  
**ORGANISMS REACTING TO STIMULI**


(* Local organisms considered)

**BIOLOGICAL ORGANISM SELECTED**

**UNDERSTANDING OF THE BIOLOGICAL STRATEGY**

**HOW THE BIOLOGICAL STRATEGY WAS INCORPORATED INTO THE DESIGN**

**EVALUATION ACCORDING TO LIFE'S PRINCIPLES**

- **Evolve to Survive**
  - the design's success is based on whether or not it contributes to the continuity of life
  - if the design builds on what works
  - there are opportunities for cross-pollination of information and ideas
  - the design receives and incorporates an influx of new information
  - mistakes are used to encourage continual idea generation

- **Resource Efficiency (Material and Energy)**
  - the design skillfully and conservatively takes advantage of resources and opportunities
  - it is respectful of the limits of habitat (e.g., water, nutrients, or niches)
  - the design meets its functional needs with minimal output of material and energy
  - a single design meets more than one need
  - the design takes the energy path of least resistance
  - the design reduces required temperatures, pressures, and/or time for reactions
  - the design reuses materials or uses recycled materials
  - it stays in either a technical or a biological cascade
  - it is designed for disassembly, reuse, and reconfiguration
  - the design uses shape and information to reduce the use of material and energy
  - the form provides the function
  - the design taps the power of limits

- **Adapt to Changing Conditions**
  - Appropriately respond to dynamic contexts

- **Use Life-friendly Chemistry**
  - Use chemistry that supports life processes
COMECOO
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HOW COMECOO WORKS

MATERIALS

Petals: NOTT-300
It's capable of retaining 90% of the CO2 that crosses itself. Low cost production.

Arms: Smart Chemical Polymer
They react by increasing or decreasing its volume with change in concentration of a molecule of CO2. By this reaction, the structural arm increases its volume and therefore the petal raises and this makes possible the retention of CO2.

Structure: Bamboo
Natural, Resistant and Cheap material