



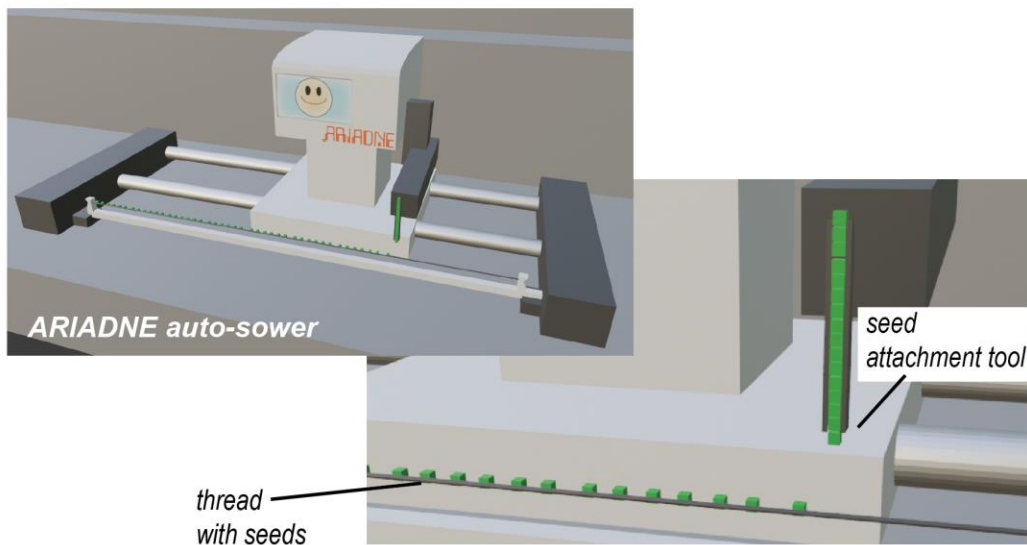
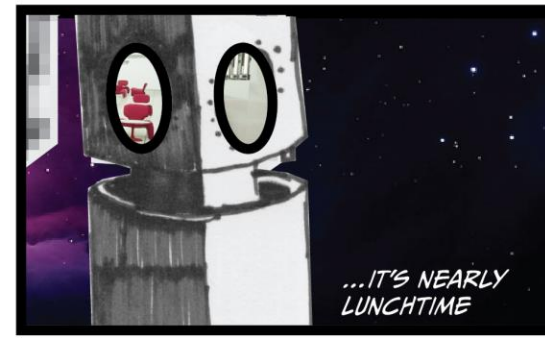
# Have Seeds Will Travel

Welcome to the Ariadne Microgreens Project



All non-project images licensed to  
J Myerscough via stock.adobe.com





The **ARIADNE** seed sowing robot is able to automatically attach pre-prepared seeds onto food-safe “threads” using very small amounts of edible adhesive. Once prepared, the threads are loaded into one or more aeroponic “Growpods” for germination and growth.

**ARIADNE** is able to:

- respond to crew feedback by sowing more of one type of seed or another
- keep track of plant position and growth
- automatically prepare planting experiments
- respond to instructions from ground control for more or less of any type of seed that is available.

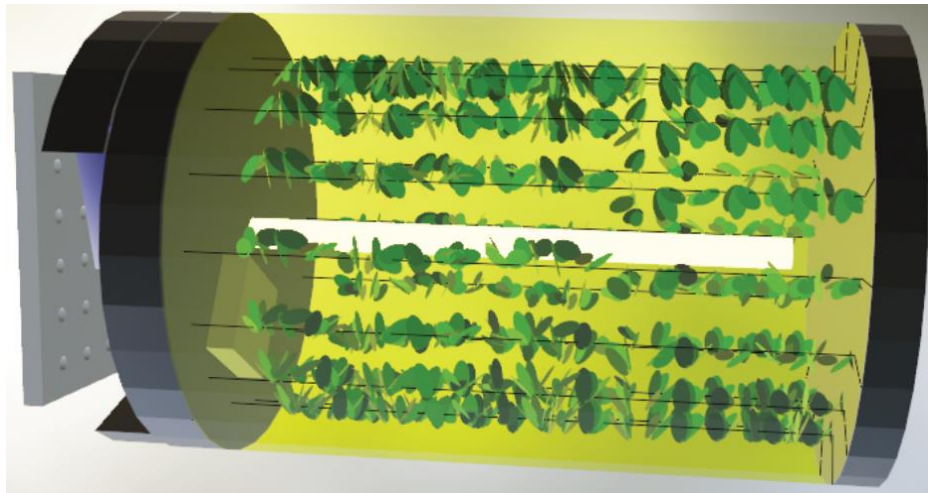
The motivation for the system was to find the simplest and most automated way to grow plants in space, in order to provide the wellbeing advantages that only fresh produce can bring.

# The Ariadne Growpod

- Once prepared, threads are loaded into the aeroponic "Growpod", a slowly rotating pod that contains an aeroponic fogger system for keeping microgreen seeds/roots at just the right moisture level. Water and nutrients are provided via a refillable pouch at the mounting side of the system.
- Sowing/growing automation allows for rapid iteration and experimentation without undue burden on the crew, while still providing crew with nutritious fresh food.
- Precise adjustment of plant mix and distribution according to crew preferences or experiment parameters.
- Cameras and sensors inside the pod allow remote data collection and analysis
- Why the growing pod? Easy to store in small space until needed. Multiple pods can fit "Russian doll" style inside each other when stowed.
- Designed to be easy to clean between use by keeping surface area to a minimum. Pod made of polycarbonate.
- Parts are as simple as possible to allow crew maintenance and repair.

## Harvesting

When a thread of microgreens is ready for harvesting, the crew simply removes then end cover and pulls out the desired microgreen thread. The leaves and parts that are edible can simply be removed, while roots can be slid off the thread for disposal, or for freezing and later analysis, leaving very little waste.



# Ariadne Growpod (detail view)

Mist Flows  
back along  
inner surface  
of the pod to  
back pump

Air  
circulation  
fan

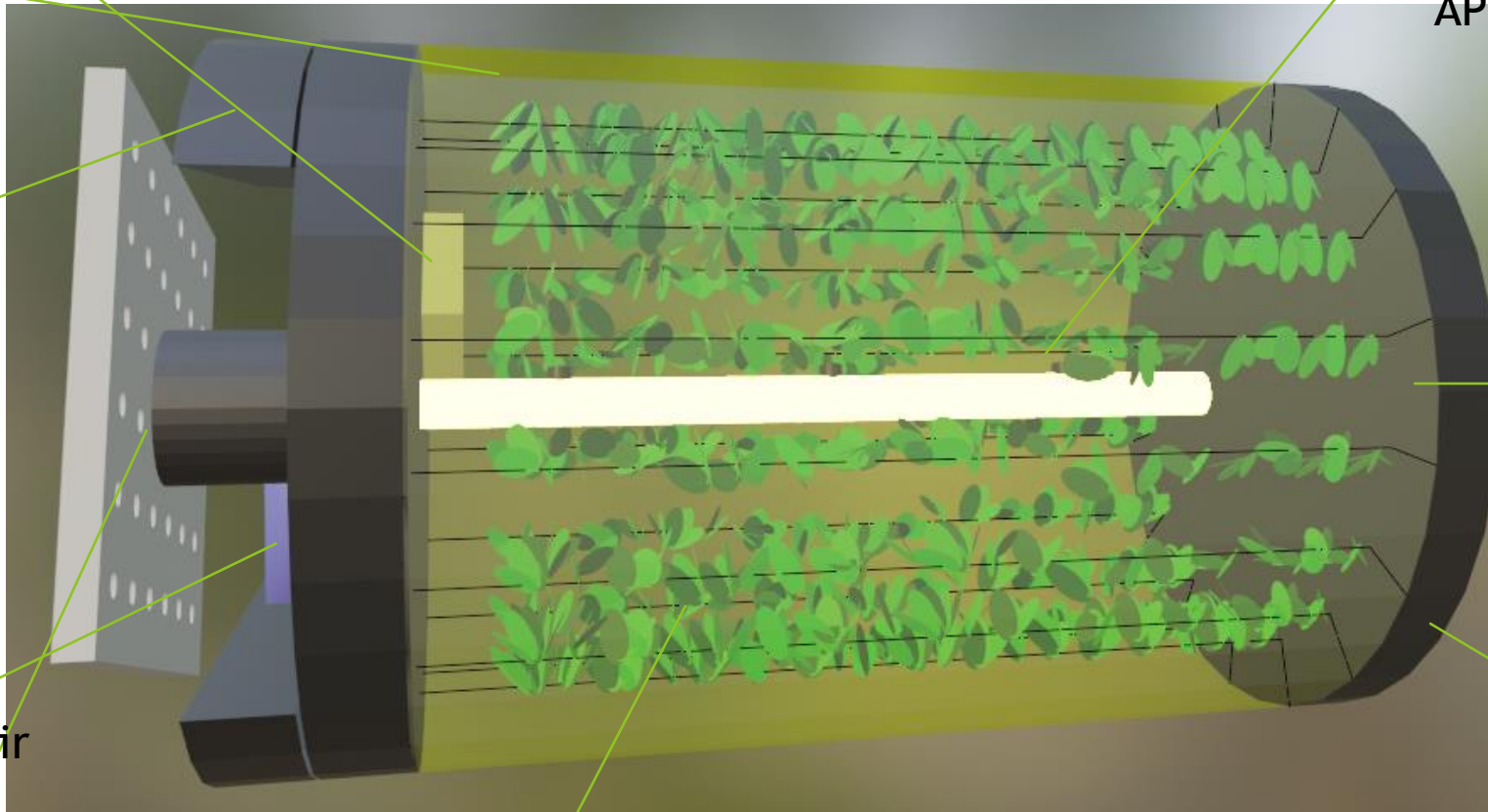
The Pod will rotate slowly along its access to  
provide a "gravity" gradient, directing mist to the  
roots of the Micro Greens.

LED and camera boom,  
White, Green, Blue, Red,  
Far Red, Infra Red. As Per  
APH.

Main Controls;  
Computer,  
sensors for temp,  
humidity, water  
levels, reverse  
pump to take  
water back into  
tank.

Water/nutrients  
pouch attached  
to mister/reservoir

Mounting Point  
and power.



With an size of  
approximately  
100cm length,  
50cm  
diameter, the  
pod will take  
little space.  
Power use 10-  
20 W total  
weight 2.5kg

Removable  
access cover

Threads with seeds (initially) then producing/growing Micro  
Greens with mixed crops being grown at any one time.



# Threads, and why we chose microgreens

*Micro Greens are incredibly fast growing, delivering fresh sustainable food within a matter of days:*

- They can deliver high concentrations of vitamins, minerals, antioxidants (Niroula et al., 2021) and selenium (Newman et al., 2021).
- Quick turn around means that fresh food can be supplied regularly.
- They can deliver psychological benefits as well as nutrition benefits, with more aromatic taste than dried food.
- Potential increase in radiation protection from certain fresh plants such as *Amaranthus*
- Simpler to grow than larger plants

*Why the Growpod?*

- Easy to store in small space until needed.
- Easy to clean between use by keeping surface area to a minimum.
- Easy to load and unload seeds/plants.
- Thread system allows automation of sowing seeds. Manual sowing also possible
- Thread system allows easy removal of plants with virtually zero waste.



# Nutritional Advantages..

**Health Benefits Achieved** - **Potassium**- regular heart beat, moving nutrients into cells and the waste out. **Iron** - red blood cells, carrying Oxygen. **Zinc** - assists Immune system and metabolism.

**Magnesium** - Supports muscle, nerve function, energy production. **Copper**- assists connective tissues, blood vessels.

**Antioxidants**- protecting cells against free radicals especially **Radiation**! **Quinoa** - high in Anti inflammatory Phytonutrients, Omega-3, **Fennel** - supports heart health helps to reduce Cholesterol, **Garlic** - Vitamin B-6 and C can help quell inflammation. Crops including **Amaranthus** actually help protect the consumer from **Radiation**.



# Final words.

NASA research has identified a need for fresh vegetables for health reasons and also pioneered the methods for studying plant growth in space. Samples are stabilised and stored for further study back on the Earth which will further improve Ariadne and her capabilities going forward in providing fresh food for longer, improving health and psychological wellbeing

Ariadne Microgreens Project brought to you by:

Julian Myerscough

Katherine Jones

## References

Niroula, A. et al. (2021) 'Pigments, ascorbic acid, total polyphenols and antioxidant capacities in deetiolated barley (*Hordeum vulgare*) and wheat (*Triticum aestivum*) microgreens', *Food chemistry*, 354, pp. 129491–129491. doi: 10.1016/j.foodchem.2021.129491.

Alina Petre (March 6 2018) *Microgreens all you ever wanted to know*, *Healthline.com*

Rachel G. Newman et al. (2021) 'Biofortification of Sodium Selenate Improves Dietary Mineral Contents and Antioxidant Capacity of Culinary Herb Microgreens', *Frontiers in plant science*, 12, pp. 716437–716437. doi: 10.3389/fpls.2021.716437. Nasa.gov 'growing plants in space'