PALE BLUE DOT: EVERYDAY MATERIAL CULTURE ON THE INTERNATIONAL SPACE STATION

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The most ordinary objects sometimes end up in extraordinary contexts. Who would have thought that the humble resealable (or snap lock/ziplock/ziploc) plastic bag was a space traveler?

Tom Marshburn, Roman Romanenko and Evgeny Tarelkin, Expedition 43. Image credit: NASA

In this image, taken on board the International Space Station in 2012, the astronaut and cosmonauts are looking very excited. That's because they've just received a rare delivery of fresh food – carrots, capsicum, grapes, and blueberries. If the photo had been taken on Earth, you might have thought they were juggling; but juggling isn't something you can do in a microgravity environment. The food is packaged in perfectly ordinary ziplock bags, each with a blue velcro dot attached. There seems to be three sizes represented. They're not the kind of bags archaeologists and geologists use, with the white stripes to write labels on.

The ziplock bags mark this food immediately as different, as most astronaut food is in vacuum-sealed metallic pouches. The image raises a number of questions. Are the ziplock bags as ordinary as I presume,

or are they special space bags? What happens to the bags once their contents are consumed? Do they become trash, returned to Earth, or are they recycled and used in different contexts in the space station?

If the latter, we might expect that a re-used bag might start to look cloudy over time, just as they do in our own kitchens. (There is something slightly pathetic about a worn ziplock bag). So it should be possible to monitor the condition of bags throughout the space station to work out how often their contents and use have been changed. And of course we'd have to find out how many each expedition has at their disposal. Indications are that they are abundant.

A kitchen in orbit

Below you can see astronaut Sandy Magnus cooking on Expedition 18, in 2008. Ziplock bags were her mixing bowls. The seal on the bags prevented the ingredients from floating away as she combined garlic, olives and sun-dried tomatoes. Her only equipment in this improvised space kitchen – there are galley areas on the ISS but no facilities for cooking as such – was a blunt pocket knife, the bags, and duct tape to hold the chopped ingredients down. You can also see the duct tape on one of the bags in this image.

Sandy Magnus, Expedition 18. Image credit:NASA

To get the ingredients she needed, Sandy had to plan well in advance before she left Earth, and experiment a bit on fellow crew members to make sure her recipes and her mise-en-place worked. It was like a MasterChef challenge.

The use of the bags, usually for storage, as a mixing bowl, is an adaptation of an artefact intended for one purpose for another. Vicky Kloeris, the manager of ISS food systems during Sandy's stint, noted that Sandy "found ways to use things beyond their original intentions".

Perhaps these are bags recycled from the fresh food delivery. When did the practice of using the bags for cooking begin? Is this a practice initiated by the astronauts and cosmonauts themselves to add variety – and a measure of self-determination – to their restricted diet? What other options might there have been for mixing ingredients?

Cooking is an everyday activity in Earth gravity but is not a feature of orbital life. Why go to all this effort to do something that requires so much planning, with perhaps dubious results? It wasn't about the taste or nutritional value of the food; it was more about a social concept. The feeling of home is important to people, and food is a big part of that – just as it is on Earth. As Sandy Magnus observed, "Special occasions have special food and our world revolves around eating food. Being able to have special dishes on Christmas and New Year's made it feel more like home."

Hang on – what was that about pocket knives? Do astronauts really use pocket knives and not some fancy sonic knife? It turns out they do. Here's a red pocket knife lying on a galley surface, in a picture taken by Scott Kelly on Expedition 43 in 2015.

A table set for three. Image credit: NASA

Here you also see food pouches, three pairs of scissors and small snap lock bags which look like they might have pills inside them. Note that one of the pill bags is velcroed down using the blue dot. The scissors are essential flatware for space; they are used for cutting open the outer food packaging. This seems to be a table set for three. To terrestrial eyes, it looks perhaps more like a medical clinic than a dining room.

A versatile container

It's not all about food, thought. Ziplock bags are used for a range of purposes on the ISS, such as:

Space 'barf bags' to deal with the common problem of space sickness

Rubbish bags

Sample bags (for human medical samples I believe)

Growing fresh vegetables

To stow parts eg lids, cables during repair and maintenance of equipment

Scientific experiments

Tool kits

Here's a gyro repair tool kit in its official, inventoried zip lock bags. Notice the specification of the restraint – velcro – to keep each bag inside the kit from drifting away as it's put to use. This is the blue dots again. Someone on Earth must have the job of sticking the dots onto everything.

TVIS GYRO REPAIR TOOL KIT
P/N: SJG33116475-301

DESCRIPTION:
Tool kit originally certified to perform IFM on failed TVIS gyroscope during 13P stage. Kit contains the following items contained within labeled Ziplock bags:

- 1 set ea Helical Insert Tools for sizes 4-40, 8-32, 10-24, 10-32
- 1 ea 3-Jaw Pressure Screw
- 10 ea 1"x12", 220 and 400 grit emery paper
- 1 ea 12 pt, ½" drive, 1-3/8" socket

Weight:
3.23 lb

Volume or Measurements:
13″ x 18″ x 5″

Type:
Outfitted

Power:
N/A

Fuse:
N/A

Restraint:
Velcro Hook

Stowage:
Standard stowage trays

ZIPLOCK BAG, FLAME RETARDANT W/ VELCRO

PART NO.	**SEZ33113225**	**-301**	**12" x 12"**
	SEZ33113225	**-303**	**13"x 18"**
	SEZ33113225	**-305**	**23"x 24"**

DESCRIPTION:

- Various sizes of flame retardant Ziploc bags for nominal crew use
- Teflon shell attached to polyethylene Ziploc

Weight:
1.63 oz

Volume or Measurements:
See Above

Type:
Consumable

Power:
N/A

Fuse:
N/A

Restraint:
Hook Fastener

Stowage:
Standard stowage trays

Limited Life:
N/A

Lineage:
JSC CTSD New Hardware Development for ISS
CR# G5602

Reference Documents:

GCAR	G3623
Materials	MATL-00-018

This one is even flame retardant! The white velcro squares are attached in the four corners of the bag, which can then be stuck onto velcro strips on the Space Station's surfaces. Restraining objects is one of the challenges of living in microgravity. This is how astronaut Garrett Reisman described it in 2008:

One of the things about working in zero gravity is you can't put anything down. That's really an issue. Just think about trying to work on your car, because when we're doing maintenance work on the Space Station it's kind of like working on a car. Every time you unscrew a bolt, you can't just put it down; you have to put it into a zip lock bag, or tape it somewhere, or Velcro it to a wall. If you just let go of it, or you turn your back on it, it may be gone when you turn back around again and good luck finding it because it's hard to find things up there. So that's a unique challenge up there. It makes it very easy to lose stuff, and it takes a long time in the beginning until you get good at managing all the parts.

The bag is an essential mechanism for recreating a feature of the Earth gravity environment that we are so used to we don't even remark upon it. It carves up a tiny bit of the directionless space into a sort of gravity surrogate. Who knew that this flimsy piece of polyethylene could replace the relentless pull of the Earth's mass?

The ziplock bag has a number of 'affordances' that enhance its usefulness in microgravity. It's flexible, lightweight, transparent, resusable and sealable. Now that I reflect upon it, I can see that the white-label-strip bags we archaeologists often use are not the best choice for space. The strips obscure the contents for a start. And once written on, the label is not easy to remove, reducing the bag's recyclability.

But what does this all mean?

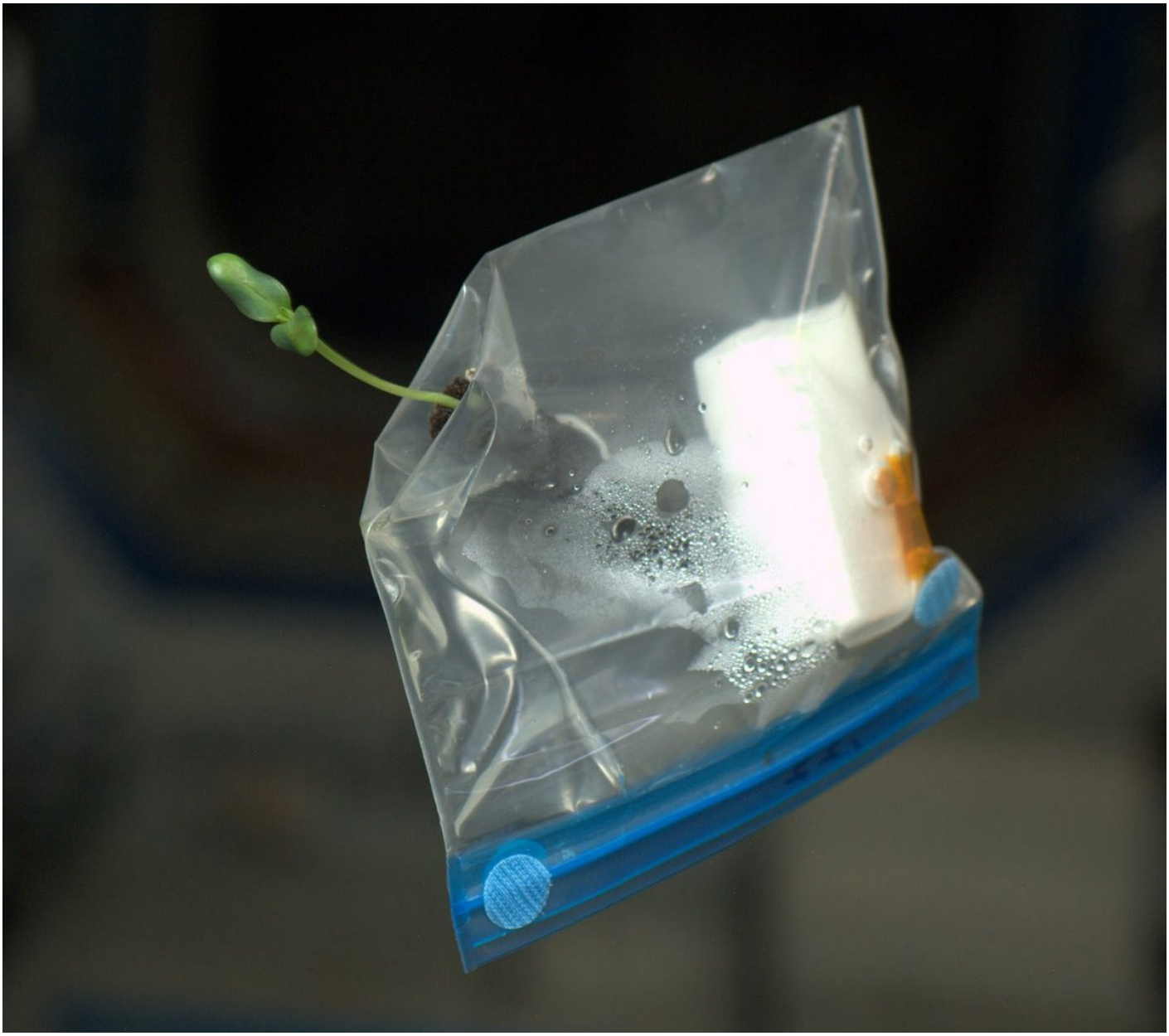
From the pictures, you can see that there is a variety of ziplock bags in circulation aboard the ISS. Their use ranges from very particular and prescribed, to very ad hoc and informal. A question I immediately want to ask is how easily the bags move between these categories and what the behavioural constraints around them are.

Space stations have to achieve a balance between all sorts of contradictory conditions. They have to be a home where people live, but situated inside a giant scientific laboratory with little privacy; they have to use the lack of up and down to make good use of limited space, but also make astronauts comfortable and productive; they have to use technologies designed and tested on Earth to make people function in microgravity.

The ziplock bag opens up questions about how astronauts use material culture to navigate these contradictions. They're the kind of material culture that people tend not to notice; they're just background environment, cheap, abundant, disposable. But here we see them playing an important role in the everyday life of the crew.

It's for this very reason that an archaeological approach to ISS material culture might bring new insights into life in space. This is why Justin Walsh and I are looking at how astronauts create their own cultures in this remote and closed world. One day there might be a space society which cannot exchange material with Earth. Then, every artefact might be the one that makes or breaks a new planetary culture.

For more information on the Archaeology of the International Space Station, you can follow us on Twitter @ISSArchaeology, on Facebook or keep up to date on our blog. Justin St Walsh has contributed to Day of Archaeology here



Sunflower seedling, grown by Don Petit. Image credit: NASA