Conviviality in Microgravity

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Manned space flight must be one of the most inspiring and exhilarating developments of the twentieth century, realizing the utopian dreams of many centuries and capturing the imagination of nations in a way that is rare for scientific advances. For the astronauts and cosmonauts involved, however, there is another side to the journey. Space travel can be a stressful, uncomfortable, and physically damaging ordeal, fraught with risk and fear. Success or failure – life or death – is completely dependent on your own performance, that of your colleagues and the technology that carries you, and the provisions you have brought with you. While this is true to some extent for all journeys of exploration, any earth-bound expedition can find something, however meagre, in its surroundings that may help as much as hinder: melted snow for drinking in the Arctic; benign plant and animal life for eating in the Amazon. In space, you have nothing other than what you set out with, including the food.

Food plays an important role in building and protecting morale, and meal times provide an opportunity to rest, relax, and build relationships as well as refuel. Besides being essential for survival, effective nutrition is crucial to ensure effective human performance: we are increasingly aware of the psychological and physical impact of poor nutrition, and the social impact of the decline of communal food sharing in Western societies. One of the many lessons I learned from Alan Davidson was that the study of food needs to be approached from every human angle: it isn't only what we eat, but it's how and why the meal is chosen; the ambiance, the company, and the setting in which we dine; and even the approach to the washing up that contribute to a successful meal. If we place human beings in conditions of extreme stress, and invite them not merely to survive but to carry out complex experiments, all the factors that contribute to how they are nourished and nurtured, and hence able to cope with their circumstances, surely become even more important. So what do astronauts, cosmonauts, spationautes and yuhangyuan eat?[1] How much influence does their national identity have on their approach to the dinner question? And how does the way they consume their food and clear up after their meals affect them?

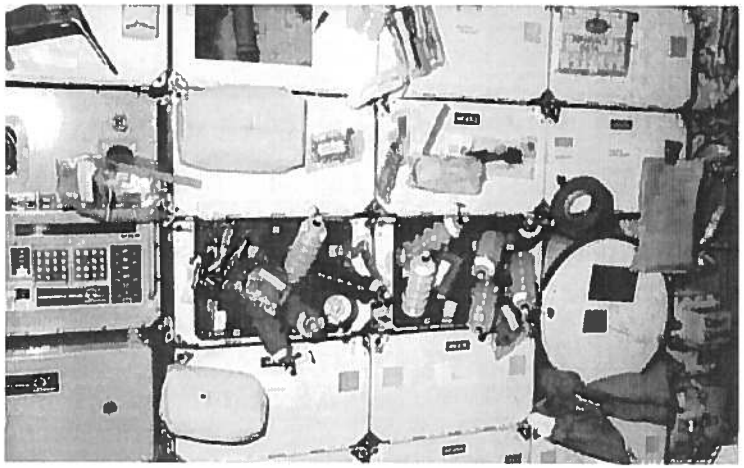
The development of space food

The possibility of human survival in space was one of the earliest questions posed by researchers. Even if all other technical problems could be solved, 'there was controversy concerning even the ability to swallow food in the weightless condition'.[2] German Titov, the first human to eat in space in 1961 aboard Vostok 2 flew for just over 24 hours, so arguably he could have survived without very much food; and John Glenn could certainly have managed without his apple-sauce during the almost 5-hour flight in Mercury 6. But if man was to travel for multiple days he'd need to eat, and evidence was needed that it would be possible.[3] Proving the fundamental point was the first step towards dining in microgravity.

Mention space food to almost any group of people and most will name products adopted for use in space (like Tang orange drink), developed for the space programme (like Space Food Sticks) or sold in science museums (like dehydrated ice cream). While many of these fun, sugary products took their place in the US space food programme, the culture driving the earliest space missions was military, and food provisioning was approached in military fashion. Special foods were developed for use in space, but the priority was to address questions of minimizing the weight and bulk of food, and its long term preservation in extreme and fluctuating conditions, rather than its flavour and presentation.[4] Although one of the early criteria for food selection was, reassuringly, that it should be 'liked by astronauts', there was a prevailing assumption that crew members would put up with a certain degree of privation.[5] Even twenty years into the US programme, Shuttle missions were often referred to as 'camping trips', where inconvenience is tolerable because duration is limited, and the 'inconvenience' of some of the early foods supplied should not be underestimated.[6]

Form and function

Both the USSR and USA initially used puréed foods in aluminium tubes (originally developed for pilots) that could be sucked though a tube inserted into the astro- or cosmonaut's helmet. For the US Mercury mission in the 1960s, bite-sized compressed foods were also developed in flavours ranging from bacon, cheese and crackers, and toast to peanut butter and fruitcake. They came in blocks of uniform size



which rehydrated in the mouth as they were chewed. In an attempt to solve the problem of crumb production they were coated in gelatine, starches, fat emulsions or hydrogenated oils, many of which either flaked, stuck together or caused digestive problems.[7] Both these food types had unpleasant texture, mouth-feel, and palatability, meaning that much food returned to earth uneaten, and astronauts lost weight. As missions grew longer in duration, and the many adverse physical effects of space travel became apparent, it also became increasingly important that crews should eat the food provided, and nutritionists recognized that it should be made more familiar and appetizing.[8]

Gemini astronauts were supplied with freeze-dehydrated meals which could be rehydrated by injection with cold water and sucked out of the package: one of Gemini's major discoveries was that astronauts don't like cold potatoes.[9] The Apollo programme had the advantage of a hot water supply, making many of the foods more acceptable. By Apollo 8 there was a new development: thermostabilized wet meat products, the first being turkey in starch-thickened gravy, which could be eaten directly from a foil package, and with a spoon. Thermostabilized foods (and the use of utensils) were something of a breakthrough, and their development continued throughout the Apollo programme. New choices were added each time: frankfurters for Apollo 11; beef and gravy for Apollo 12; meatballs in sauce for Apollo 13.[10] Later, travellers in Space Shuttle and Soyuz, and people working on the space stations Mir and Skylab, could build up a varied menu from an array of familiar frozen and irradiated dishes in addition to the thermostabilized and re-hydratable options. These more recognizable foods could be reheated in

specially designed receptacles or sometimes ovens, and were much more readily accepted by the astronauts.

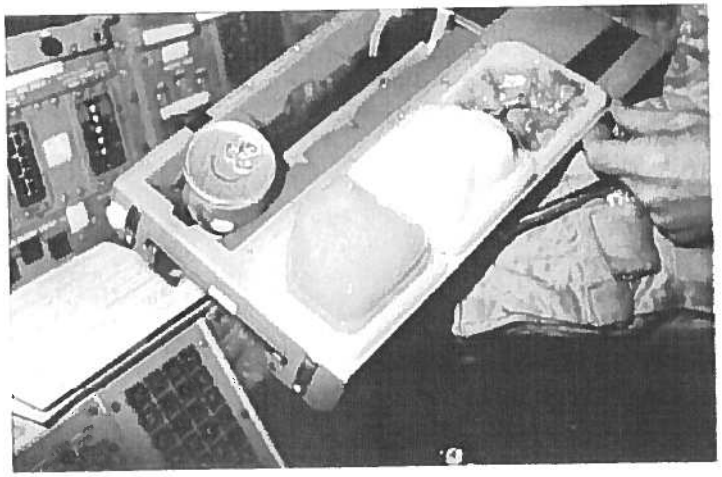
Selecting the menu: food and cultural identity

One of the problems with choosing your food several months in advance is that it doesn't necessarily taste the same in space. Perhaps as a result of the significant fluid shift to the head that happens in microgravity, or a low intake of zinc (associated with dysfunction to the senses of smell and taste), stronger flavours are tolerated and even craved for in a way that is not seen on the ground.[11] Russian cosmonauts commonly demand more garlic and Americans more chilli to counter the taste problem, and condiments are an essential component of the space larder.[12] Astronaut Joseph Kerwin reported that, in Skylab,

> The German potato salad was quite spicy, and on the ground most of us did not select it very often so it did not occur in our meals. When we got up there we found that the very best thing in the world was German potato salad, and I must shamefully confess that by the end of Skylab1, our flight, there was no German potato salad left in the pantry.[13]

The fact that you only have the food you pre-ordered several months ahead, and that it is often delivered to the destination before you are, underlines the potential impact of this kind of shift in taste perception.

As with their earth-bound fellow humans, another important factor in the food choices of astronauts is where in the world they come from and what they are used to eating.[14] Although a great deal of research and development effort has gone into the production of suitable foods for

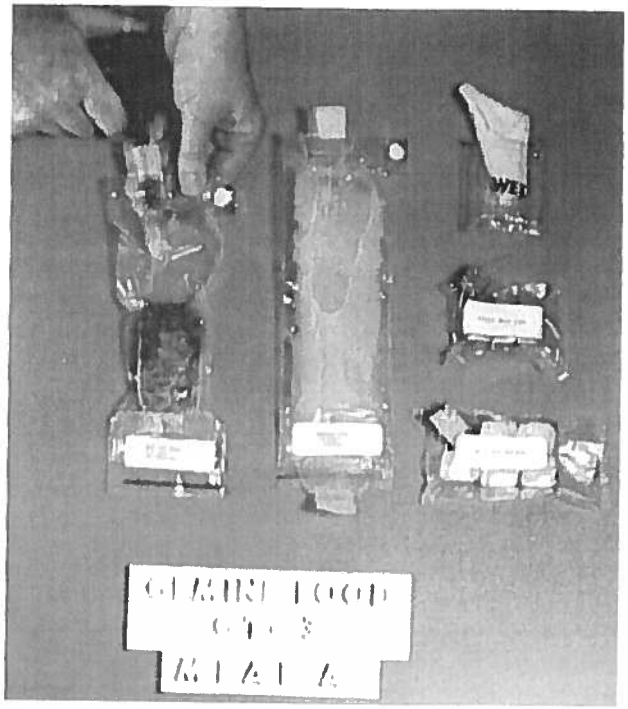


space missions, this has not resulted in standard food for every nation that participates in a space programme. Cultural differences can be readily identified by examining the foods developed for space in different countries. Each nation's views on the others' choices are also revealing.[15]

Feeding the space super-powers

The US food list today consists of branded items like Kellog's and Quaker breakfast cereals, Kraft puddings, Del Monte canned fruits, M&Ms, Fruit Loops, and Planter's peanuts, alongside a variety of standards, like macaroni, chocolate cake, shrimp cocktail, scrambled eggs, wheat tortillas, tuna and various classic American meat-based dishes, such as chicken à la king.[16] Russian cosmonauts can choose from such typical dishes as cabbage soup, rye or black bread, pork and potatoes, beef stroganoff, beetroot soups and salads, tvorog (cottage cheese with nuts), beef tongue with jelly, spiced and pickled perch, and buckwheat gruel. For a morale boost on special occasions like Thanksgiving NASA provides traditional foods, such as turkey, smoked or in gravy, and candied yams; and before the cost cutting enforced by the collapse of the Soviet Union, the Russian Space Agency sent up caviar and pâté for New Year and birthday celebrations, which was rumoured to be washed down with bootleg vodka or cognac.[17]

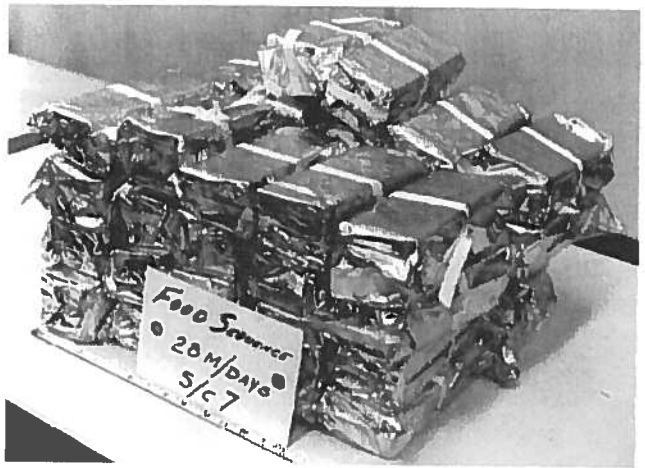
The Chinese, too, retain and reinforce their cultural identity while eating in space. Cutting is an important and specialized technique in Chinese cookery, and dishes from most regions comprise carefully cut, bite-sized pieces. Chinese food technologists have therefore developed



an alimentary membrane which can enclose mouthfuls of food with sauce, ready to be heated and consumed whole by the fortunate Chinese yuhangyuan – but not using chopsticks.[18] Strong flavours are popular in space flight, and dishes on the menu in 2003 included Sichuanese kung pao chicken, shredded pork with garlic, the celebratory dish 'eight treasure lotus' porridge with lotus seeds and longan and moon cakes. The food was described proudly by the national news agency as 'Chinese food for Chinese astronauts' and 'more tasty than Western Food'.[19] The menu was expanded significantly in 2005 to include cuttlefish and meat balls, beef with orange peel, and sweet Chinese 'Hami' melon.[20] Food can now be served hot adding considerably to its appeal.

World food in space

Despite having only shared participation in space programmes, the French have worked consistently to assure their reputation as a nation of gastronauts as well as gastronomes. Patrick Baudry, the first French astronaut on a US spacecraft (Space Shuttle Discovery in 1985) was dismayed that NASA disallowed his wine, but consoled himself with



supplies of lobster, jugged hare à l'Alsacienne, pâté de fruit and cheese.[21] In the late 1990s a chef from the Perigord, Richard Filippi, supplied duck confit, squid in lobster sauce, and toffee rice pudding to the Mir space station; he would 'cook quails in wine sauce ... debone each quail, slice it up and reconstitute it perfectly, down to the tiny wings, in a 3.5 ounce tin'.[22] These gourmet dishes were viewed as a treat rather than a staple of the mission, and French astronauts bonded with their Russian colleagues by sharing them on special occasions. But prejudices held on Earth survive the transition into orbit, intact. The chef commented that 'I once tasted the food the US astronauts eat and it was not what you would call memorab ... I ate some green stuff, but I couldn't tell you what it was. ... What we cook ... tastes of Earth'.[23] Today, in the same spirit, the *Alain Ducasse Formation* prepares duck confit with capers, caramelized carrots, and swordfish for space missions.[24]

Other countries with astronauts but without their own space programme also contribute to the international menu. The Malaysian National Space Agency is working with chefs to ensure that its astronauts will be able to enjoy such staples as *teh tarik* ('pulled tea'), *roti canai* (bread), and coconut rice when they go into orbit.[25] A Japanese TV chef, Sachiki Hoshizawa, developed 'healing' miso soup for orbital consumption on behalf of the National Space Development Agency of Japan.[26] Meanwhile, Space Ram, or 'astro ramen' in soy sauce, miso, curry and pork broth flavours were launched into space with Japanese astronaut Soichi Noguchi on board Space Shuttle Discovery in 2005.[27]

Conviviality, morale and sharing

Space agencies have recognized that conviviality and good food are essential to the morale of their crews, in particular on longer space missions, and that a lack of good facilities may have contributed to weight loss and depression on previous missions:

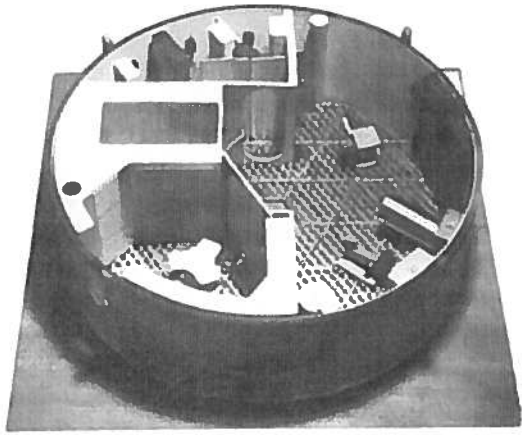
> The food system not only provides the nutrients needed for the survival of the astronauts but also enhances the well-being of the crew by being a familiar element in an unfamiliar and hostile environment ... Not only will the food provide the needed nutrition, but mealtimes will provide a major socialization event. Highly acceptable foods can play a primary role in reducing the stress of prolonged space missions.[28]

Eating with colleagues and bonding over meals expands the contribution of food beyond the mere ingestion of necessary nutrients.

International missions present excellent opportunities for food sharing. Not only do the different food systems introduce welcome variety, they provide an opportunity for relationship building that is difficult to replicate by other means. While working on Mir with two Russian crew, American Jerry Lineger noted the impact that food can have on personal relationships, and used it to his advantage:

> I have been working hard on some very complex experiments ... in general, doing a pretty darn good job around here. Not a word from my Russian crewmates. But today, I ate buckwheat gruel for breakfast, the Russian equivalent of Spam in a can for lunch, and *twordik* ('sour cottage cheese'), beet soup, jellied fish, and currant juice for dinner, and were they ever impressed! First American they ever saw put down the whole packet of gruel, they said. And no one else even attempted the sour cottage cheese. I won them over.[29]

It is not only what you eat but how you choose to eat it that makes the difference. 'International crews will have different food preferences and eating habits. For example, some American crew members appear content to eat "on the run" and by themselves, whereas many European crew members prefer eating a complete meal as a group.'[30] The meal-tray design on the Space Shuttle fits in with this 'American' view of eating. A sheet of aluminium with Velcro and magnets to hold the food down which can be strapped to the leg, the meal tray is an optional item in the astronaut's kit, and not all of them choose to take one with them.[31] French astronaut Patrick Baudry was certainly shocked by the Americans' attitude to food and to eating, challenging a NASA commander who said that meals were a waste of time:



Our food tradition is very ancient ... It is part of our civilisation. It is very important ... I don't think a meal is a waste of time ... A meal is not only food. It is much more than that. The meal is the moment when everybody is together and there is a discussion of the activities. It is a very good moment for friendship.[32]

Evidence from Skylab showed that he was right. The first space programme where astronauts didn't lose weight and actually ate all of the food provided, it was also the first with a living area carefully designed for convivial food sharing including a dining table with built-in time-controlled food heaters.[33] The designer Raymond Loewy 'chose a triangular shape [for the table] to bring all three crewmen into equal position with respect to each other'.[34]

A look at spacecraft design demonstrates that the historic lack of conviviality in space is not only down to the variable quality of the food. It can surely be partly attributed to lack of living space. As space programmes have evolved and journey time increased, the habitable volume available in spacecraft has also increased, although it is the development of space stations for longer term research missions of many months' duration that has forced the designers to take living space seriously. The Gemini programme had such a small habitable volume that any movement by the crew of two was difficult. The Apollo crew had a mere 5.95m, although this was three times that of Mercury. The Space Shuttle, designed to combine with a lab and accommodate a bigger crew, provided a more generous 71m, comparable to Salyut's 85m. Contrast even this with the 275m available in Skylab, up to 400m in Mir, and 1,100m in the International Space Station (ISS) and you begin to see a real shift towards living and working rather than simply

travelling in space.[35] The Chinese are echoing the trend with a new Orbital Module with expanded living space, including food preparation facilities, on Shenzhou 6, the rocket launched in 2005.[36] Clearly, available space offers the possibility of conviviality, and the effect on crew morale and nutritional intake is striking. Skylab proved to be 'the only programme in which all nutritional requirements were met by foods'.[37] Although much of this can be attributed to the close monitoring of crews' food intake and eating habits, it could also be argued that the opportunities for sharing made a difference.

Portion control

It is not only the design of the spacecraft that contributes to the isolation experienced in space travel. The necessity to wear a helmet along with the rest of a bulky suit, to almost be wearing your habitat, influenced the approach to feeding. The focus was on the individual, and even though the crew now only need to wear the protective but constricting suits for take-off and landing, bite-sized portions and single servings remain the norm. This is partly, again, a quest for efficiency both in initial bulk and subsequent waste management. The 'cooking' dish doubles as the 'serving' dish and can be crushed and disposed of as a single item. It is also easier to handle food in small quantities in an environment where it is as likely to fly across the cabin as obediently move from dish to mouth. However, for longer duration missions bulk food preparation and reusable dishes are being considered. Besides contributing to waste reduction this approach to cooking and serving could only have benefits for team building and morale.[38] Regardless of the quality of the food, sharing in exactly the same meal at the same time provides greater conviviality than consuming different foods at different times (or arguably even at the same time), and in particular in comparison to consuming snack foods on the run. It is ironic that it might take travel to Mars and efficiency arguments to reinforce the superiority of the classic model of the family meal.

Completion: who does the washing up?

The purification of the utensils has to be the final, culminating stage of any meal, the stage which in effect sets the scene for the next meal and permits life's processes to continue – even the proudest shoppers and cooks, exalted by witnessing the true climax of the meal, must acknowledge the precedence of these acts of completion.[39]

Alan Davidson's paean to washing up may be somewhat tongue in

cheek, but the fact remains that clearing up is an essential element in the ebb and flow of meals and mealtimes, and an important signifier of participation in the small rituals of daily life, all of which contribute to well-being. Cleaning up is no easy matter in space, where the difficulties inherent in handling all kinds of waste, including potentially hazardous food-related waste, have taxed the minds of many. On Mir, the unmanned *Progress* vehicle which delivered supplies to the space station was filled with all of the rubbish, including used food containers, sealed, and released. After floating free for a few days a command from Earth fired its retro-rockets and the craft and its contents were incinerated on entry into the atmosphere.[40] This spectacular approach to washing up almost matches the semi-religious significance of the ideal described by Davidson (admittedly in a somewhat pagan manner), though it might be more satisfying for the participants in the meals if they could actually witness the act.

Other space travellers are even less fortunate in this regard. As early as 1964 the potential for 'real' washing up in space by means of a centrifugal washer was described by an enterprising member of the Whirlpool Corporation, who envisaged 'a rotating bowl, equipped with racks to hold utensils ... water jets issuing from a centrally located spray head remove soil ... Water is removed from the spinning bowl by use of a pick-up disc'.[41] Unfortunately, the alternative option whereby food waste and containers are compressed, stored in the freezers the original food emerged from, and returned to Earth for disposal has come to be the norm.[42] However, there is hope: if the long term mission plans develop in the way envisaged, and communal meals cooked in a single receptacle and served on reusable dishes become the new standard, there will be scope for arguments over who does the washing up, even on Mars.

Recognition of human and psychological factors

Attitudes have changed. In the late 1960s it was recognized that lack of stimulation contributes to feelings of stress in astronauts, but in a culture where it was possible to say that 'Interviews with each astronaut regarding his food likes and dislikes have proved to be of little value', a suggestion to use hypnosis to compress off-duty time, 'create the illusion of stimuli', and reduce metabolic rate to conserve food and water seemed like a rational potential solution to the problem.[43] Today, food is recognized as an important and useful stimulus, and the leader of the advanced food system team at the Johnson Space Center states, 'We have

no scientific data that says this but our gut feeling is that food plays a big role in the psychological health of the astronauts, especially on longer missions.'[44] The Russians agree: 'For a long-duration flight, the food has a big impact on a person's feeling in space.'[45] On a two year mission to Mars, it is recognized that 'Food for astronauts [will be] incredibly important. Eating and preparing food will often be their most important moment of the day.'[46]

The human urge to eat well and to share good food is a strong one. In 1965 when John Young smuggled a fresh sandwich (corned beef on rye) onto Gemini 3 to share with Gus Grissom, the result was a congressional investigation, an official reprimand, and a public assurance that steps would be taken to prevent any recurrence of illegal sandwiches.[47] Now, there's a real possibility that culinary skills and an interest in the production and preparation of food will become part of the selection criteria for space mission crew members.[48] Alain Ducasse and his team are busy preparing recipes for the foods that will be grown and cooked during a two-year mission to Mars. It will take more than a sandwich to impress nowadays: fresh homemade Spirulina gnocchi, anyone?[49]

NOTES

1. Each nation with a major interest in space has preferred to create its own term for its space heroes. The USSR coined the term Cosmonaut (explorer of the cosmos); the Americans, Astronaut (star explorer); and the French, Spationaute (space explorer). The official Chinese term Yuhangyuan (universe traveller) is now used instead of the alternative Taikonaut. Coined by a Chinese Malay *taikonaut* is a hybrid of Chinese (taikong meaning space or cosmos) and the Greek suffix used elsewhere, and hence considered insufficiently Chinese.
2. Wayne D. Van Huss and William W. Heusner, *Space Flight Research Relevant to Health, Physical Education, and Recreation, With Particular Reference to Skylab's Life Science Experiments* (Washington DC: National Aeronautics and Space Administration, 1979), p. 2.
3. Christian Lardier, *L'Astronautique Soviétique* (Paris: Armand Colin, 1992), p. 131; see also Helen W. Lane and Daniel L. Feeback, 'History of Nutrition in Space Flight: Overview', *Nutrition*, 18:10 (2002) 797-804.
4. For example, in Apollo the temperature could vary from -5° to 60°C; humidity from 30% to 90%; and absolute pressure from 19.7 psia to $1x10^{-8}$ psia. See Mitchell R. Sharpe, *Living in Space, The Astronaut and his Environment* (London: Aldus Books, 1969), p. 131.
5. W. Vishniac and F. G. Favorite, eds, *Life Sciences and Space Research VIII, Proceedings of the Open Meeting of Working Group V at the Twelfth Plenary Meeting of COSPAR, The Symposium on Nutrition of Man in Space* (Amsterdam: North-Holland Publishing Company, 1970), p. 267.
6. Richard L. Sauer, ed., *Food Service and Nutrition for the Space Station* (Washington DC: NASA, 1985), p. 20.

7. Crumbs are dangerous to man and instrumentation in space, since they cannot be removed or cleaned up in microgravity and may easily cause blockages to equipment and choking in people. See also, Vishniac and Favorite, *Life Sciences and Space Research*, p. 269.
8. Michele Perchonok and Charles Bourland, 'NASA Food Systems: Past, Present, and Future', *Nutrition*, 18:10 (2002) 913-14. The microgravity of space travel causes a number of physiological effects, such as muscle atrophy (related to protein intake); bone atrophy (related to calcium, phosphorous, vitamin D); space sickness (fat intake); cardiovascular deconditioning and occasionally in-flight cardiac arrhythmia (sodium, water, potassium intake); loss of red blood cells (iron and folic acid intake); and orthostatic intolerance (an effect on the human erect posture – lack of pressure makes astronauts 'grow' by several inches). Nutrition is carefully balanced to attempt to mitigate these effects, but the overall result is generally weight loss and weeks or months of recovery time on return to Earth directly related to length of time spent in space.
9. Herbert A. Hollender, 'Introductory Remarks', *Activities Report: Feeding Systems in the Space Age, Proceedings of the 24th Annual Meeting – Research and Development Associates for Military Food and Packaging Systems*, 22:2 (1970) 8-12 (p. 9).
10. Hollender, 'Introductory Remarks'.
11. Helen W. Lane and Dale A. Schoeller, *Nutrition in Spaceflight and Weightlessness Models* (Boca Raton, Florida: CRC Press, 2000), p. 32.
12. Salt is provided in bottles, dissolved in water; pepper suspended in oil.
13. Sauer, ed., *Food Service and Nutrition for the Space Station*, p. 55.
14. Lane and Feeback, *Nutrition*, 18:10 (2002) 800.
15. Barbara L. Rice and Helen W Lane, 'Dietary Studies in the Joint US-Russian Space Program', *Journal of the American Dietetic Association*, 97:10, supplement 2 (1997) S127-28 (p. S128).
16. Perchonok and Bourland, *Nutrition*, 18:10 (2002) 913-14.
17. Lane and Feeback, *Nutrition*, 18:10 (2002) 801; see also, 'Cosmonauts Lose Dietary Delicacies', *The Globe and Mail*, 14 October 1995, p. N2. Barbara Hertenstein, 'Russian Home Cooking Goes Into Space', *St Louis Post-Dispatch*, 9 November 1992, p. 17.
18. Jonathan Lipman and Merry White, 'Astro-Wraps, or How the Chinese Are Winning the Space Race', *Gastronomica*, 4:3 (Summer 2004) 3-4 (p. 4).
19. Lipman and White, 'Astro-Wraps'. See also, Geoffrey York, 'Beijing set to launch manned spacecraft; Ascent of Chinese "universe traveller" astronaut seen as big boost to presence on world stage', *The Globe and Mail*, 9 October 2003, p. A3.
20. 'Outer Space Fish Balls Real Chinese Take-away', *Agence France Press*, 12 October 2005.
21. National Desk, 'A la Carte: French Astronaut Plans to Eat High on the Hare', *Los Angeles Times*, 18 June 1985, p. 8.
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23. Ford, 'French Chef Stirs Up Space Food'.
24. ESA Portal – France – Prêt pour un diner sur Mars?, <http://www.esa.int/esaCP/SEM2PK1DU8E_France_1.html>, accessed 14 June 2005.
25. Space travel website, <http://space-travel.com/reports/Malaysias_25_Million_Dollar_Astronaut_Program_On_Track_Official.html>, accessed 30 August 2005.

26. Teo Pau Lin, 'Show and Tell', *The Straits Times*, 5 February 2006.
27. Space travel website, <http://www.space-travel.com/reports/After_Conquering_Earth__Instant_Noodles_Make_Space_Debut.html>, accessed 30 August 2005.
28. Perchonok and Bourland, *Nutrition*, 18:10 (2002) 916.
29. Jerry M. Lineger, *Letters from Mir: An Astronaut's Letters to His Son* (New York: McGraw-Hill, 2003), pp. 30-31.
30. Lane and Schoeller, *Nutrition in Spaceflight and Weightlessness Models*, pp. 7-8.
31. Lane and Schoeller, *Nutrition in Spaceflight and Weightlessness Models*, p. 22.
32. *Los Angeles Times*, 18 June 1985, p. 8.
33. The Official Website of Raymond Loewy, <http://www.raymondloewy.com/about/bio.html>, accessed 23 April 2006.
34. Paul Levy, *Out to Lunch* (London: Chatto & Windus, 1986), p. 172.
35. Lane and Schoeller, *Nutrition in Spaceflight and Weightlessness Models*, pp. 3-5.
36. Space Daily Portal, 'More Room for Shenzhou' <http://www.spacedaily.com/reports/More_Room_For_Shenzhou.html>, accessed 20 November 2005.
37. Lane and Schoeller, *Nutrition in Spaceflight and Weightlessness Models*, p. 4.
38. See, for example, the European Space Agency Advanced Life Support website, <http://ecls.esa.int/ecls/?p=melissa>, accessed 30 April 2006.
39. Alan Davidson, *The Oxford Companion to Food* (Oxford: Oxford UP, 1999), p. 839.
40. Lineger, *Letters from Mir*, p. 42.
41. Norman G. Roth, 'Experience with Life Support Systems', *Activities Report: Feeding Systems in the Space Age, Proceedings of the 24th Annual Meeting – Research and Development Associates for Military Food and Packaging Systems*, 22:2 (1970) 13-21 (p. 20).
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43. Vishniac and Favorite, eds, *Life Sciences and Space Research VIII*, p. 278; see also, Sharpe, *Living in Space*, p. 70.
44. Matt Bradley, 'A Thanksgiving that's out of this world', *Christian Science Monitor*, 23 November 2005, p. 13.
45. Adam Tanner, 'Need a Cosmic Meal? That'll be $435, Sir', *Reuters News*, 14 August 1998.
46. 'Mission to Mars: Cuisine that will be out of this world', *Agence France Press*, 20 October 2004.
47. Pamela Kessler, 'Food That's Really Out of This World', *The Washington Post*, 13 December 1985, p. N50.
48. Lane and Schoeller, *Nutrition in Spaceflight and Weightlessness Models*, no page no.
49. ESA Portal – France – Prêt pour un diner sur Mars?, <http://www.esa.int/esaCP/SEM2PK1DU8E_France_1.html>, accessed 14 June 2005.

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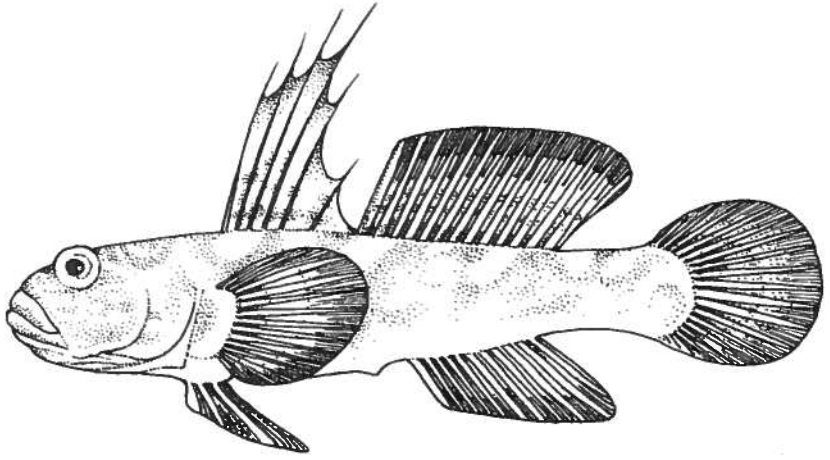
1. p. 164. View of Space Shuttle Columbia's galley, showing a water gun for rehydrating food, meal tray assemblies, packets of juice and assorted food items tucked in amongst jackets and experiments.
Courtesy of NASA, accessed via
http://images.jsc.nasa.gov/luceneweb/caption.jsp?searchpage=true&keywords=foo

d&selections=null&textsearch=Go&hitsperpage=5&pageno=9&photoId=STS004-28-330

2. p. 165. A food tray designed for the Skyab programme, containing ready to eat food: from left; orange drink, strawberries, asparagus, prime rib, dinner roll and butterscotch pudding (centre). The tray is surrounded by more packets of food: from bottom left; grape drink, beef pot roast, chicken and rice, beef sandwiches and sugar cookie cubes.
   Courtesy of NASA, accessed via
   http://images.jsc.nasa.gov/luceneweb/caption.jsp?searchpage=true&keywords=food&textsearch=Go&hitsperpage=5&pageno=3&photoId=S72-15409
3. p. 166. A Space Shuttle food tray in use, containing packets of dehydrated food and a drink.
   Courtesy of NASA, accessed via
   http://images.jsc.nasa.gov/luceneweb/caption.jsp?searchpage=true&keywords=food&selections=null&textsearch=Go&hitsperpage=5&pageno=6&photoId=STS009-05-153
4. p. 167. Food packets for use on the Gemini 3 flight including dehydrated beef pot roast, bacon and egg bites, toasted bread cubes, orange juice and a wet wipe. Water is being inserted into the pouch of dehydrated food.
   Courtesy of NASA, accessed via
   http://images.jsc.nasa.gov/luceneweb/caption.jsp?searchpage=true&keywords=food&selections=null&textsearch=Go&hitsperpage=5&pageno=16&photoId=S65-10971
5. p. 168. Food packets for the Gemini 7 space flight packaged and ready for loading.
   Courtesy of NASA, accessed via
   http://images.jsc.nasa.gov/luceneweb/caption.jsp?searchpage=true&keywords=food&selections=null&textsearch=Go&hitsperpage=5&pageno=14&photoId=S65-61653
6. p. 170. "Skylab, Model for Living", a model of Raymond Loewy's design for the Skylab crew area, showing the dining table on the left-hand side.
   Courtesy of the Raymond Loewy foundation, accessed via
   http://www.raymondloewy.org/gallery/skylab.html



Eat Art and Communities: From Oxford to Melbourne

ALICIA RIOS

Alan Davidson (AED) has been a seminal force in the creation of the community of the Oxford symposiasts. His innovative attitude, his sympathetic productiveness, his thaumaturgic vision of the new discipline, integrating all the dimensions of food history and cookery, has been altogether fruitful. In the last twenty-five years the *vis davidsoniana* has nurtured the collective curiosity and the efficient activity of a great diversity of interdisciplinary researchers. In my view, these researchers embody to perfection an emerging, evolving, and consolidating community of productive minds.

From my experience of having created quite a few performative activities for communities, I would like to suggest the Oxford Symposium of Food as a reference model of how the concept of a new community is conceived, develops its internal cues and laws, and goes on growing according to the internal logic of its everchanging needs. A working community, or working with communities, includes and absorbs the idiosyncratic identities of its constituents. The singularities of each of the individuals are transcended but also integrated. The newly formed community, if properly managed, brings to the flourishing of its activities synergy and productivity.

The brilliant intuition of AED, in the case of the Oxford Symposium, sharpened not only new ways of observing, seeing, and understanding certain aspects of reality, which became translated into the themes of the different editions of the symposia, but also enabled the sharing of the discoveries. There were no barriers, fears or limits to the expression of individual knowledge within the security that was inspired by the communal curiosity. That is how a working community becomes *gestaltic*: its productivity is global, cannot be understood simply as the sum of individual approaches, but as the true spirit of search and research.

Every fertile discovery on a proposed theme, and its subsequent publication as a paper, gets its eloquence from its coherence with the subject. But its contents reflect the *quanta* and the *qualia* of the different

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