Feedback Man

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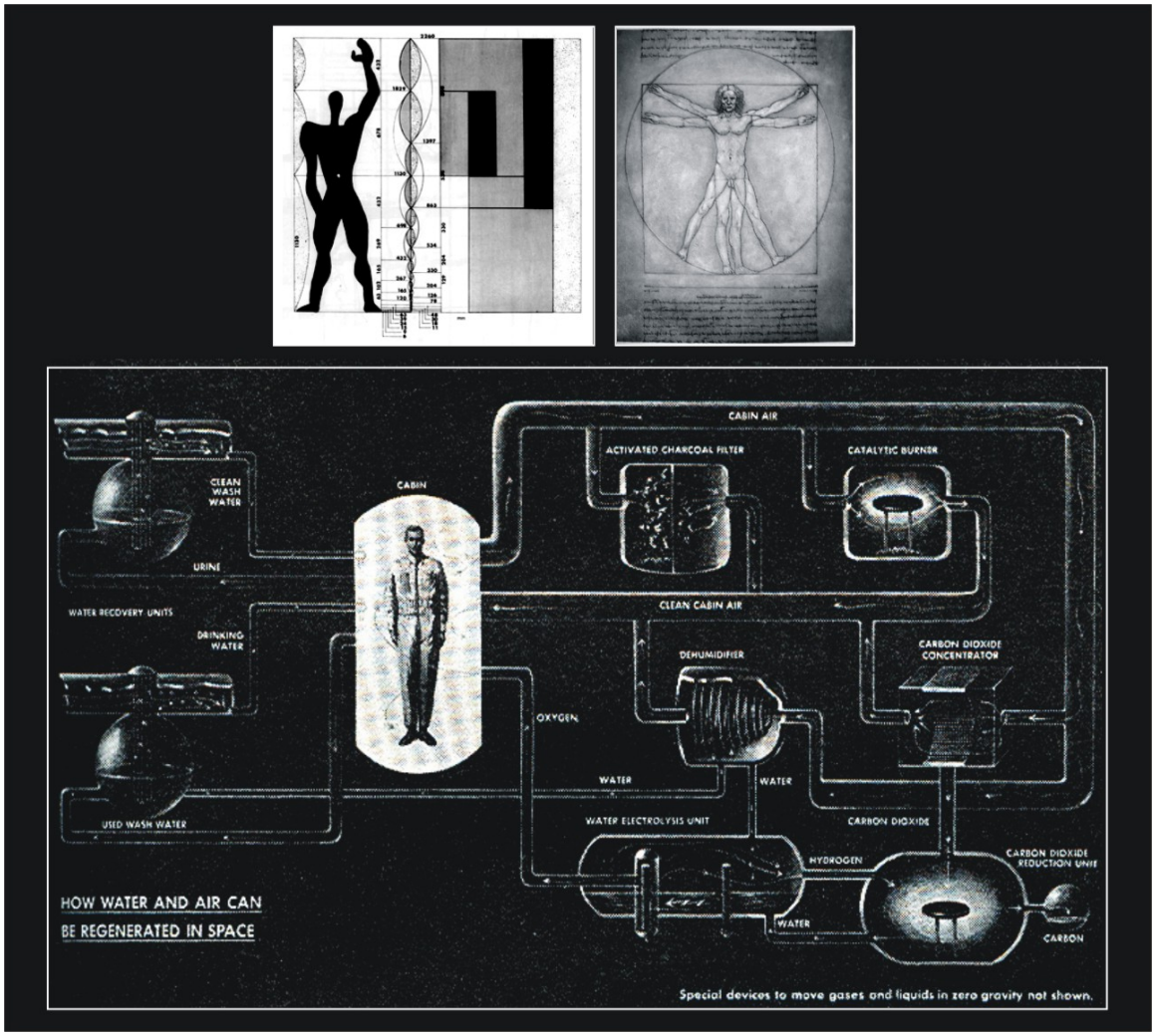

NASA Langley Research Center, 1960. Four men are enclosed and monitored for four months in a living simulator, a hermetically sealed environment called the NASA living pod. In order to survive without additional provisions inside this experimental spaceship, in order for man to venture into outer space where the environmental conditions are inhospitable to his physiology (as NASA tells us),[1] it is necessary that all human waste be converted to oxygen, water, and, hopefully, food. The General Dynamics diagram for a life-support system[2] visualizes this problem-solving obsession of monitoring, capturing, and recycling human subsystems. As we can witness, a new biotechnological image of man is emerging, one where human agency is delegated in terms of input and output.[3] At the same time, the diagram shows man entirely bound to his

environment, since only with the service of digesters, converters, dryers, and dehumidifiers can all cycles of ingestion and excretion be closed and redirected back into the body.

The General Dynamics diagram was reproduced in several architectural publications,[4] including *Architectural Design*, *Bau*, and *Adhocism*, portraying the new vision of man and the space he inhabits (shrinking the natural world) as if he were tied to its walls and parts with an umbilical cord. In many respects, architectural drawings of man are a measure of worlds, an image personifying the architecture of different eras. Thus, Vitruvian Man, inscribed in a circle, speaks of a period of geometrical supremacy (Renaissance humanism), while Le Corbusier's Modulor, measured on an external reference line, is an architectonic vision of idealized proportions underwriting modern architecture.[5] Now, however, the General Dynamics diagram projects the materiality of the body dissolved in a series of flows and feedback loops compressed to a spacesuit or a pod.

The image of man as a heroic explorer who overcomes his given physiological boundaries and conquers uninhabitable lands was of larger cultural interest in the 1960s, projecting the astronaut as a new universal human subject. "Astronauts are envoys of mankind," states the Outer Space Treaty of the United Nations in 1966.[6] The astronaut, masked and geared, became a positive figure of unbounded progress, equipped to carry in his spacesuit and functional vesture a piece of the earth's environment. Outer space, the bottom of oceans, Antarctica – exceptionally unfriendly regions to the physiology of humans – were all part of an envisioned new democratic political reality. Outer space and its corollary regions were places for all that defied property and territorial commitment. In this vast, blank space, humanity had a second chance to reinvent itself from scratch.

This "democratic" venture came at a very high, almost deadly cost, however, with the resurgence of a primitive fear that a man could be buried in the combustive products of his own body. In case of a systemic malfunction, excrement could kill him or contaminate his environmental "egosphere."[7] In this sense, the system could not be anything less than 100 percent foolproof, with compulsory regeneration its maxim and material loss negligible or nonexistent within the closed state. Inhabited space was in the faithful service of closing all loops: a capsule furnished with garbage units embedded in the walls to collect urine, carbon dioxide collectors, floating human waste divisions – all necessary parts in order to accumulate all waste and facilitate feedback.

In this enclosed experiment, the subjects experienced nausea, headaches, and eventually contaminated the system with their own waste. Shed hair, fingernails, and skin infiltrated the collectors; eventually the subjects had to be removed from the cabin earlier than expected. . What is important to observe in this case is that the malfunction of the system was not the direct result of the malfunction of its subsystems or feedback loops. The subjects did store their waste in the designated compartments after conducting their daily personal hygiene routine, as illustrated in the feedback diagram. Yet, floating waste material, material so finely grained that it could not be incorporated into the recirculatory process, escaped and eventually randomly coagulated in disorderly patterns, namely contaminants. These very contaminants were considered "new bodies" produced by the system (the coagulation and sedimentation of free-floating energies), leftover byproducts from the transference process central to the metabolic model reduced to sediment and crystallized into new, extraneous material bodies.

Captain Robert Freitag, deputy director of the Manned Space Flight Center at NASA, declared in a conference at Princeton University in the late 1970s that much is yet unknown in many areas of interaction associated with the development of a closed ecosystem. He proposed that algorithms had to be developed to define the basic supporting relationships between man, animals, plants, and microorganisms in order to define the conditions under which ecological closure might exist. This area could prove to be the single most demanding technology to be developed in the 20th century.[8] After years of experimentation with ecological closure, biologists at the time came to similar conclusions: despite the rigor of mathematical formulas, contained artificial ecosystems were unpredictable in their evolution.[9] If subtle ruptures occurred in any of the systems' parameters, closed worlds had no "healing mechanism." Notwithstanding a decade of investment in ecological research, Stewart Brand confessed that self-sufficiency as an idea was a kind of hysteria.[10]

While technically infeasible, the visualization of closed systems and the imagery of their performance have provided a powerful visual language that has inspired architects ever since. As opposed to the Vitruvian Man and Le Corbusier's Modulor, where man physically occupies space, the cybernetic model illustrates an operational fusion between man and milieu. Rather than a vocabulary of ergonomy, "feedback man" illustrates a dissolution of the materiality of the body to the elements of space, a biotic de-synthesis, echoing, one could argue, a death wish. With feedback man, the compact images of Da Vinci and Le Corbusier are necessarily expanded, while

the established boundaries between body and environment become elastic. Vitruvian Man and the Modulor indicate a passage from the cosmos to modernist abstract space, while feedback man bespeaks of an insular, closed techno-world that requires more information than form and geometry to be envisioned. Such a reading of the man-space relationship, integrally bound together, necessitates a larger diagram, where ambient environmental information can be registered. Interpreted beyond the functional scope of life support, the General Dynamics diagram signals nature being artificially transferred into the cosmos;[11] it is a certain hubris speaking of the impossibility of a passage that as a species, we, still, have not yet earned.

Endnotes

[1] The sealing of four men in the NASA Langley Simulator is narrated in NASA's promotional motion picture for television, *The Case for Regeneration* (1960). Motion Picture No. 255-HQ-131A, Special Media Archives Services Division, National Archives, College Park, MD.
[2] The NASA Langley Simulator was a collaborative project between General Dynamics and the NASA Langley Research Center.
[3] See Peder Anker, "The Ecological Colonization of Space," *Environmental History* 10, no. 2 (2005): 239-268. See also Peder Anker, "The Closed World of Ecological Architecture," *The Journal of Architecture* 10, no. 5 (2005): 527–52.
[4] The diagram was first published in the *International Science and Technology* journal in 1966. See "Keeping Alive in Space: A Report from General Dynamics," *International Science and Technology* (February 1966): 52–53.
[5] This comment emerged in conversation with Alexandros Tsamis at MIT, Cambridge, MA, March 2008.
[6] See the Outer Space Treaty, signed in Geneva in 1966. United Nations Archives, New York, NY.
[7] The term *egosphere* is found in Peter Sloterdijk, "Cell Block, Egospheres, Self-Container," *Log* 10 (Summer/Fall 2007).
[8] Captain Robert F. Freitag, "Summary of Problems of Greatest Urgency," Princeton University Conference on Space Manufacturing Utilities, 1977. M1045, Series 1, Box 1, Whole Earth Access, *CoEvolution Quarterly* Records, Stewart Brand editorial files, Correspondence. Department of Special Collections, Stanford University.
[9] See John Todd's response to Gerard O'Neil's "Space Colonies," in Stewart Brand, ed., *Space Colonies: A CoEvolution Book* (San Francisco: Waller Press, 1977), 48–49. For earlier reference, see Howard Odum's discussion in the *American Biology Teacher* 25 (1963): 423–43.
[10] See Stewart Brand, "Local Dependency," in *Soft-Tech: A CoEvolution Quarterly Book,* eds. Stewart Brand and Jay Baldwin (San Francisco: Waller Press, 1978), 5.
[11] See Todd's response in *Space Colonies,* 49.