Emerging Ecologies:
Architecture and the Rise of Environmentalism
Arch 630 – Architectural Theory
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03.07.24
WHY HERE, WHY NOW?

- The built environment produces 42% of the world’s annual carbon emissions

- The built environment worsens the problems of capitalism, extractive post-colonialism, and social injustice

- Heavy cradle-to-cradle environmental impact

- As architects, we can do something about this
Traditionally, architects work here
MOMA MODERN ARCHITECTURE EXHIBITION, 1932
MOMA EMERGING ECOLOGIES EXHIBITION, 2023-24
Emerging Ecologies

Architecture and the Rise of Environmentalism
1950

1953

Serge Chermayeff begins teaching his Environmental Design course at the Harvard Graduate School of Design (GSD) in Cambridge, Massachusetts, which is required for all students, whether they’re majoring in architecture, landscape, or planning.
2000

Chemist Paul Crutzen popularizes the term “Anthropocene” to describe the current geological epoch, in which human activity has significant impact on the Earth’s climate and ecosystems, rivaling that of natural processes.
MOMA EXHIBITION 2023-24

- Architects from 1950s-1990s address themes of overpopulation, the depletion of natural resources, and the effects of pollution

  - Environment as Information

  - Environmental Enclosures

  - Multispecies Design

  - Counterculture Experiments

  - Green Poetics
ENVIRONMENTAL ENCLOSURES
Some General Considerations

Because it is expedient, although not entirely justified, to treat the shielding which protects against the dangerous radiations of space separately from the choice of the geometry of the habitat's structure, that problem is left to a subsequent section. Subject to possible effects of the shielding, the choice of habitat geometry is determined by meeting the criteria of the previous chapter at minimum cost. In considering how different configurations may supply enough living space (670,000 m³) and how they meet the physiological and psychological needs of people in space, the following discussion uses the properties of materials outlined in appendix A. Throughout, aluminum is assumed as the principal structural material.

The Habitat Must Hold an Atmosphere

The simple fact that the habitat must contain an atmosphere greatly limits the possible forms. For economy in structural mass it is essential that large shells holding gas at some pressure must act as membranes in pure tension. There is, in turn, a direct relationship between the internal loading and the shape of the surface curve of such a membrane configuration. Also, when the major internal loads are pressure and sp induced pseudogravity along the major radius of rotation, R, the possible membrane shapes must be doubly symmetric, closed shells of revolution (refs. 5, 6). Figure 4-1. Subset of Cassini curves which, when revolved, generate possible geometrics.

Figure 4-2. Basic and composite shapes.
having in space permanent communities of sufficient productivity to sustain themselves economically.

Size and Suitability of Population

It is possible in principle to specify a productive task, for example, the manufacture of solar power satellites, and then calculate the number of people necessary to perform it, the number needed to support the primary workers, and the number of dependents. The sum of such numbers does not accurately define the population needed to found a colony since the calculation is complex. Even a casual consideration of what is necessary for a truly closed society would suggest that a colony population be far in excess of any reasonable first effort in space.

A similar approach would bypass the calculation just described and simply copy the population size and distribution of a major productive urban center on Earth. The difficulty, however, is that such communities are quite large, on the order of some hundreds of thousands of people. Moreover, close inspection reveals that human communities on Earth are less productive by labor for measurement standards than what would be needed in at least the early stages of space colonization.

One way to have a colony more productive than Earth communities would be to make the colony a factory, populated only by workers. The colony wo
COUNTERCULTURE EXPERIMENTS
Michael Reynolds –  
Earthship Biotecture  
Taos, NM 1970s - present
HEATING AND COOLING SYSTEM - House as a battery

The sun is the source of heat. The Earth itself is a battery to store heat. Earthship uses both these phenomena in the design.

Earthships store energy by wrapping every room with 3' thick dense walls. It interlaces with the wall by aligning with the phenomenon of thermal mass.

ELECTRICAL SYSTEM -- House as a power plant

The simple admission of sunlight reduces the need for daylighting. The vessel is a small independent power station. It uses the energy of the sun and wind in a clean way. It collects the energy from windmills and photovoltaics and stores it in batteries to be used later.

ENERGY CONSUMPTION OF A HOUSEHOLD IN A YEAR - 10,656 kWh
ENERGY PRODUCED BY A WINDMILL - 400 kWh per month at 12 MPH (5.4 m/s); (12 feet (3.72 m); 50-330 RPM)
GREEN POETICS
VENTURUS WIND GENERATED DWELLING
FOR MR. AND MRS. PETER CLARK
EUGENE TSUI

© ELEVATION AND SECTION THROUGH ENTRANCE TUNNEL
INFLUENCE
Emilio Ambasz -
Prefectural Int’l Hall,
Fukuoka, Japan 1990
Rafael Vinoly - The Hills at Vallco Cupertino, CA 2015
Ron Rael – Skylos
San Luis Valley, CO
2022 – present
My doctoral work focuses on practice-based design research about how built and natural environments worldwide can have a positive impact on community cohesion and environmental resilience, and may contribute to fostering a regenerative culture.

Regenerative culture refers to humans evolving from ego-centric, through socio-centric, to bio-centric ways of approaching life. It moves beyond the idea of the Anthropocene with a leap in human self-awareness that considers the human species as one facet of a larger, interconnected, timeless ecosystem.

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