Columbia University Graduate School of Architecture, Planning and Preservation
SCALES OF ENVIRONMENT
Architecture IV Studio - Spring 2014
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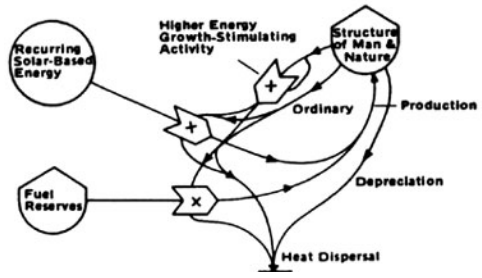
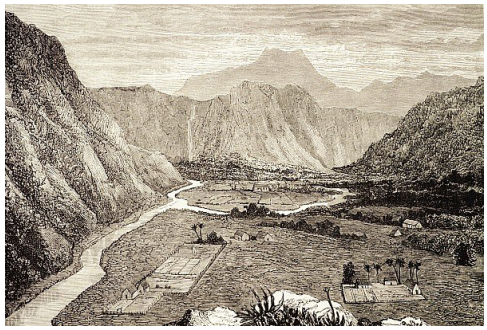
SURVIVAL BY SYMBIOSIS
Section 6
Critic: Julia Watson

Symsagittifera roscoffensis (formerly *Convoluta roscoffensis) were first described in the 1920's by Englishman J. Keeble, as a 'plant-animals'. These flat, translucent worms, similar to seaweed, are packed with platymonas cells, phytosynthesizing algae that feeds the worms from the inside, forrming a miniature ecosystem.*



Energy diagram by ecologist Howard T. Odum indicating generalized world model of man and nature based on one-shot fossil fuel usages and steady solar work.



c. 1826 lithograph, William Ellis C., Big Island. Waipio Valley, Ahupua'a. The Ahupua'a is an old Hawai'i term for a large traditional socioeconomic/ geologic/ climatic subdivision of land.

Introduction

Darwin's evolutionary theory of 'Survival of the Fittest', characterizes the evolutionary history of the dominant civilizations and has led us to the present time of rapid urbanization and climate change. However, upon microscopic inspection of miniature ecosystems 'Survival of the most Cooperative', seems to be the more successful and most ecologically sound evolutionary theory to follow. Coined by biologist Lynn Margulis, this evolutionary theory of symbiotic systems will be the dictum of the studio in which we will envision building the symbiotically and eco-technologically advanced environments of the future.

Symbiosis, a term coined by the German botanist Anton Debar in 1873, is the living together of very different kinds of organisms. Symbiogenesis, an idea proposed by Russian biologist Konstantin Merezhkovsky in 1909, is the formation of new organs and organisms by symbiotic mergers. It is often the case that the two beings are so intimate that it is difficult to say where one ends and the other begins. An example can be found on the northwest coast of France, in the form of a strange, luminescent green 'seaweed'. Initially described as a plant-animal, the flat, translucent *Symsagittifera roscoffensis* (formerly *Convoluta roscoffensis*) worm is packed with phytosynthesizing algae. These green Platymonas cells live and grow, feed and excrete, then reproduce and die, inside the worm. They function simultaneously as the food source and digestive system for the worm, whose mouth ceases to function after hatching. Fed by the sun, the algae leaks photosynthetic products that feed its host, later recycling the worm's uric acid waste into nutrients for themselves, thereby forming a miniature ecosystem. This concept of a symbiotic ecological and economic system draws parallels with the emerging concept of the Circular Economy.

PLANT + ANIMAL = NEW SPECIES

[PLANT + ANIMAL] + INFRASTRUCTURE = NEW TECHNOLOGY

Ecosystem Innovation

We think of the 'ecosystem' as a recently evolved concept, coined by Sir Arthur George Tansley and popularized by the systems thinking of brothers Howard T. Odum and Eugene P. Odum. However the concept of 'ecosystem' has always existed for indigenous Amerindian, European & Asian cultures, especially as water-shed based units. Island and coastal communities have been adapting their natural shoreline ecosystems for millennia, to ensure protection and cultivation. Some examples of coastal/oceanic ecosystems include the Ahupua'a of Hawaii, the Vanua of Fiji, the Pauva of the Solomon Islands and the rockwall fishtraps of the Lardil and Yangkaal of the Wellsley Islands in Australia. Other land to lucastrine/estuarine examples include the construction of artificial reefs and islands. These systems rely on the decay of organic matter to function as sources of food or floatation and include the Acadja Aquaculture of the Tofinu in Benin otherwise known as the 'Venice of Africa', the 'Mesopotamian Venice' Mudhif Islands of the Ma'dan in of Iraq and the Totora Islands of the Uros in Bolivia.

The acadja aquaculture system is the primary building block of the 30,000 inhabitant aquatic village of Ganvie (airphoto above) known as the 'Venice of Africa', located in the center of Lake Nokoue in Benin, West Africa.

Socio-Ecological Systems (SES)

Primarily understood by their indigenous communities as nature-based cosmological spatial systems, they are also highly constructed landscapes. As systems they are characterized by extremely high biodiversity and extraordinarily low ecological footprints. While indigenous environs are often thought of as untouched, in fact they are embedded with sophisticated eco-technologies and intricate symbiotic management systems that control interspecies interactions. These coevolved landscape systems are scientifically studied as 'socio-ecological systems' (SES) and are a key concept in the resilience framework, defined by their ability to deal with change while continuing to evolve.

In reality, there are neither natural nor pristine systems without people, nor social systems without nature. Social and ecological systems are not just linked but truly interconnected and coevolving across spatial and temporal scales. As a biophysical unit, SES can work at various environmental scales, and can be studied from the perspective of an entire unit or dissected as a series of interdependent landscape eco-technologies. Whatever the scope of analysis, the ecological intelligence of these unexplored eco-technologies can be migrated and adapted to new environs to evolve our toolkit of solutions for designing resilient environments. The migration and coevolution of new SES to solve contemporary and on-coming ecological crisis, will be the charge of the studio.

Program

The school will offer K-12 environmental education that engages ecological symbiosis and resilience as its core curriculum. Understanding the environment as a implicit extension of the classroom, the studio will explore how a school can function as a framework for developing contemporary socio-ecological communities. To advance this thinking, summer programs will be offered for advanced research on the migration of existing models of other social-ecological systems and their adaptation to new environs. These would include the introduction of migrated eco-technologies that better protect and produce, through aquaculture systems, island community building or artificial reefing along aquatic urban interfaces.

Site

The site of the studio will be located within Long Island Sound, an estuary of the Atlantic Ocean, that lies between Connecticut to the north and Long Island, New York to the south. The Sound is 113 miles long, 21 miles wide (at its widest) with an average depth of 63 feet that holds about 18 trillion gallons of water. The Sound's watershed extends to the headwaters of the Connecticut River near the Quebec border and includes nearly 9 million people.

Long Island Sound is among the most important and valuable estuaries in the nation. In 1987, Congress designated Long Island Sound an Estuary of National Significance.

The Sound has been designated an Estuary of National Significance and has a ong history of aquaculture. While it already exists as a site of significant study for shellfish, seaweed and eelgrass aquaculture, we will be exploring its intertidal zones as sites for the SES migration. The studio, will explore the development of an institution of national significanve that will establish itself as an extension of the Bridgeport Aquaculture School. Within the sound students will be targeting a series of shallow, estuarine sites as remote experimental aquaculture classrooms. The studio will envision its programs working in conjunction with programs established by the Connecticut Sea Grant Program, Long Island Sound Foundation and New York Sea Grant Institute.