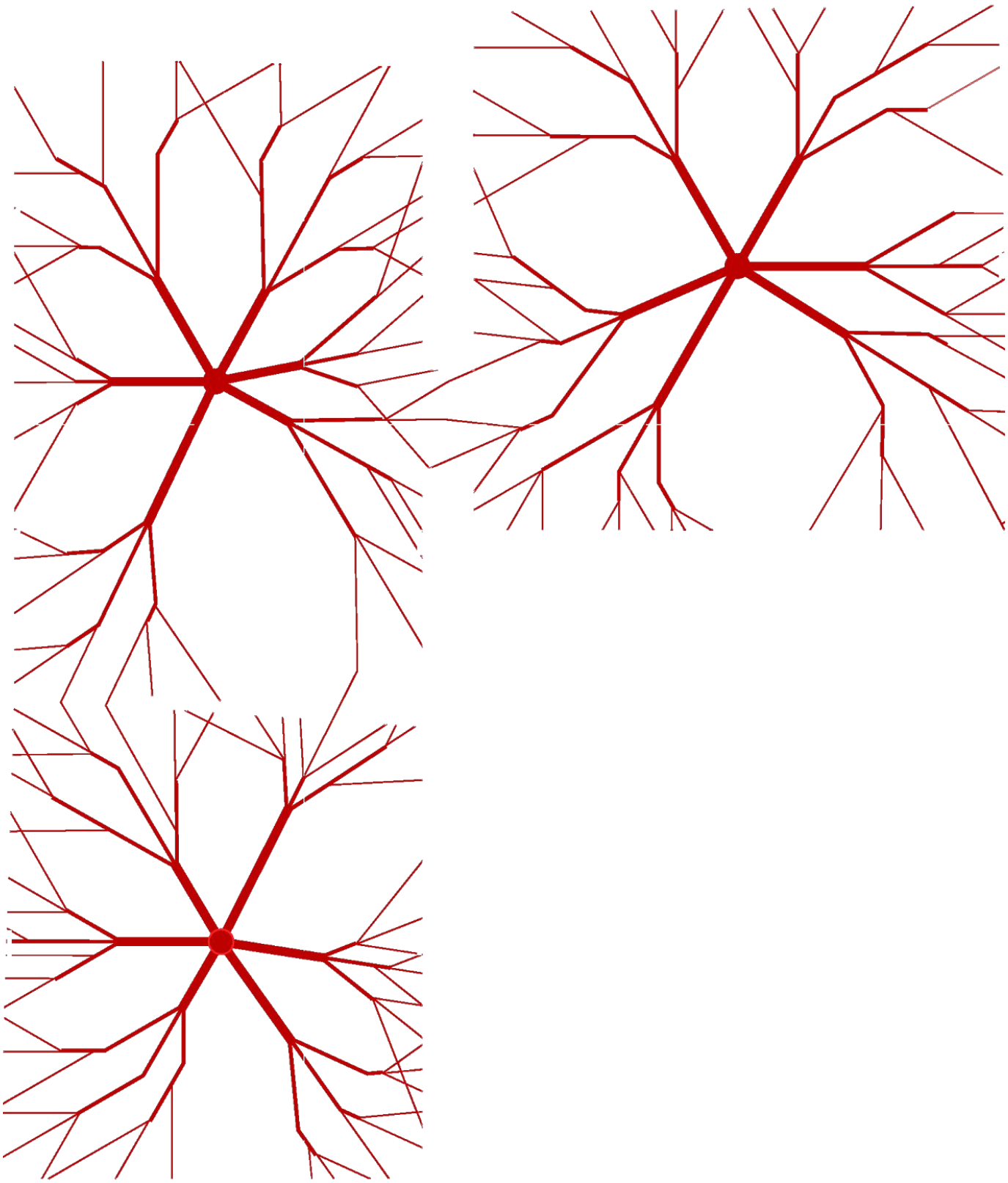


EMERGING RESILIENCE

Reimagine urban voids
through sharing values
Concept and Content of
Montenegrin Exhibition at
16th Biennale in Venice 2018

CONCEPT / CONTENTS

INTRODUCTION

Our new millennium, considered already as the Anthropocene Era, propose unprecedented challenges for humanity. For the first time, we are conscious of our direct influence on the ecosystem and finally we are aware that our critical cognitive and operative structures based on mechanism paradigms are obsolete and will not work anymore. We are moving to an Ecosystemic collective consciousness that will manifest in all domains and fundamentally in the design of our environment.

MECHANIC PARADIGM

In our modern times, we were taught that our houses are “machines for living” (Le Corbusier), and as well our cities: “the cities will be part of the country; I shall live 30 miles from my office in one direction, under a pine tree; my secretary will live 30 miles away from it too, in the other direction, under another pine tree. We shall both have our own car. We shall use up tires, wear out road surfaces and gears, consume oil and gasoline. All of which will necessitate a great deal of work … enough for all.”

On *those* paradigms, most modern cities were designed, as a “top down” projects, resulting in fragmented and not sinergetic conception of the modern urban planning and spatial planning. The humans needs as an “engine” of the endless and abundant consumer based society disconnected the humans from its integral relations with the environment and natural energy flow. Urbanists and architects were designing units divided by categories of use, type and pathways as a cartesian response to *mechanic* paradigm of production and leaving.

Numerous examples of contemporary urban plannings manifest these very pathologies of fragmentations and segregation (well investigated by art movements as Dada and Situationist Psychogeography), once the economical shared values that bounded the urban tissue changed and new external pressure started to transform the forces of our natural environment as the actual **Climate Change.**

Jane Jacobs insisted in her analysis of the decline of cities in the 1950s that they should be considered as **living organisms** with their own metabolism and modes of growth, - a notion that led her to become one of the first people to recognize how complex systems of many interacting parts can display orderly, **self-organized behavior**.

The planned, geometrically ordered cities have long been seen as the ideal. As geometry became the dominant aspect of ancient Greek thought, its influence extended beyond architecture into the way in which the buildings themselves were arranged in settlements. The grid street plan was evident even in the cities of Babylon and Assyria, but is most apparent in the towns built by imperial Rome. The fact is that **cities are not static objects but growth forms** with a logic that eludes our rectilinear geometric tradition.

ORGANIC PARADIGM

Growth in nature emerges from different strategies, and various mathematical models were used in modern history to simulate such patterns as Mandelbrot fractals, DLA, cristal crystal proliferation, slime molds, bacteria colony proliferations and so on. And in fact, there is not a single model that could simulate the system of our cities’ growth, space optimization, or interconnections. Rather we should consider multiple and synchronic approach.

In order to **“heal” marginal spaces and urban voids**, first of all we need to change our mindset from a “mechanic” understanding of the world and consequently urbanism and architecture to a new **organic paradigm**. **“Voids” and “accidental landscapes”, are in nature opportunities of self-organization, determined by relational interconnections of energy, material and information flowing through the system.**

That evolutionary shift of consciousness may be the first and fundamental step in order to operate the **natural technology** of our “Spaceship Earth”. **Nature is a 3.8 billion year old designer**. In fact, Nature is solving problems we are facing all the time, on different scales. We can find solutions in complex systems of how a forest operated for example or in simple ones as a colony of microorganisms proliferate intelligently through limited patterns. Differently from the mechanic paradigmas of how we designed our urban landscapes, nature works as an integrated ecosystem, balancing dynamic forces. **Nature operates as a resilient system because the “shared value” of all organisms is that of a collective survivor.**

We were “told at the school” the the strongest survive, as that was a “law of nature”. That is a law of our actual obsolete global unconscious consuming society (and misuse of the Darwinian concept), while the recent studies approach evolution on the basis of **collective and mutual organisation.** The biosphere evolving with the aquatic and terrestrial species and the organisms are numerous **symbiotic and cooperative relations**. **Resilience in nature is about creating relationships**. **That's how a forest works.**

So what can we learn from biological systems? They are incredibly complex. Take, for instance, the rich complexity of a rainforest. It too generates complicated interactions among many billions of components. Yet many rainforests manage to remain stable over many thousands of years, in spite of countless disruptions and “shocks to the system.” **Can we understand and apply the lessons of their structural characteristics and apply that to resilient urban design and spatial planning?** It seems we can. Here are four such lessons extracted from distributed (non-centralized) biological systems that we will discuss in more detail:

1. **They have interconnected networks of pathways and relationships.** They are not segregated into neat categories of use, type, or pathway, which would make them vulnerable to failure.
2. **They have diversity and redundancy of activities, types, objectives, and populations.** There are many different kinds of people doing many different kinds of things, any one of which might provide the key to surviving a shock to the system (precisely which can never be known in advance).
3. **They have a wide distribution of scales of structure,** from the largest regional planning patterns to the most fine-grained details. Combining with (1) and (2) above, these structures are diverse, inter-connected, and can be changed relatively easily and locally (in response to changing needs). Component based systems.
4. Following from (3), **they (and their parts/components) can adapt and organize in response to changing needs on different spatial and temporal scales, and in response to each other.** That is, they can “self-organize.” This process can accelerate through the evolutionary exchange and transformation of traditional knowledge and concepts about what works to meet the needs of humans, and the natural environments on which they depend.

CONCEPT / CONTENTS

Resilient cities evolve in a very specific manner. They retain and build upon older patterns or information, at the same time that they respond to change by adding novel adaptations. They almost never create total novelty, and almost always create only very selective novelty as needed. Any change is tested via selection, just as changes in an evolving organism are selected by how well the organism performs in its environment. This mostly rules out drastic, discontinuous changes. **Resilient cities are thus "structure-preserving" even as they make deep structural transformations.**

In Nature (considering human domain of phenomenological perception) void spaces organise themselves in organic and inorganic patterns, in a constant adaptation and interrelation to internal and external forces, manifested through the flow of energy in the system. These forces manifest as patterns of the desert sand organisation, wrinkles of water, dynamics of waves, to organisation of bird flocks flying in groups and finally how our social organisation is shaped. In nature, voids are opportunities for new forms. Climatic, geological, hydrological, sociological and behavioroligical interactions take place on differents scales following dynamic self-organisation principles.

All humans and all other living beings emerge from, and exists within, the dynamic processes and phenomena of the natural world, and they have had, and continue to have a profound effect upon it. Energy, information and material flow through all the forms of the world, and human forms and culture have co-evolved and developed within those forces.

EXHIBITION DESIGN AND CONTENTS

We can say that all forms emerge from the dynamic processes by which natural systems, both living and non-living, produce organize arrangements of materials in space and time. The pattern of energy flow through living forms and through all the forms of human culture, the networks of the cities and states, is subject to many fluctuations and perturbations. Learning from natural systems is fundamental in order to understand adaptable strategies that could be applied as models and toolkits to resilient urban design and spatial planning.

For the development of the exhibition design and content of Montenegrin Exhibition at 16th Biennale in Venice 2018, we created a multidisciplinary team of **architects and biologists**, that analyzed different organic and inorganic processes that deal with spatial organisation. Two main layers of narratives were designed for a visitor's journey:

1. **Main physical installation inspired by the forest ecosystem.**
2. **A Series of self-organizing organic and inorganic digital models**.

Those two layers of content exhibit will contextualize the public in an immersive installation; while the **forest represents a resilient ecosystem (and community based superorganism)**, the screens display **toolkits of spatial organization natural strategies applicable to ouser urban planning.**

EXPOGRAPHIC FORMAT

For the implementation of the concept we designed an **immersive installation that "grows" through the rooms of the Malipiero Palace** ground floor. This strong but gentle gesture proposes **"trees" made out of natural ropes that connect between each-other by branchings through different rooms, as a "forest" would do. (**Ropes are as well a significant element, present in the naval history of the Adriatic sea).

The branches runs through the ceiling, fixed by transparent nylon on the existing wood beams, diminishing in diameters and finally coming to the walls connecting a series of screens (Tablets). The same occupancy and design strategy was developed for each room but with variations in "growth" morphologies according to room geometry and according to public route through the space. Thought as a free-flow exhibition, the expographic concept guides the public, that will be invited by curiosity to follow the branches that pass from room to room through the doors. By discovering the rooms of the Montenegrin Exhibition, **the public will be immersed in a synergistic relationship with the two main exhibition strategies: a sensorial "forest" made out of rope trees in organic (while mathematical) paths, and content oriented screens that display the models and explain the relations with city.** Furthermore, a general concept text and curatorial text will be installed on the entrance room complete with credits.

The whole installation is designed to be easily transported and reinstalled, as original dimension, or adapted one; to new locations in Montenegro and other destinations.

CONTENTS

Global context: the **forest as ecosystem** manifests the latest researches that shows a breakthrough news that in fact trees communicate between each other through the root system extended by fungi, that **live in a mutually beneficial relationship**. **That interrelation creates a decentralized and distributed network of nutrients and informations**, allowing the forest to quickly adapt to changes. We acknowledged how cities could be resilient when they embrace processes as forest operates.

Local context: the screens display applicable experimental toolkit on different scales and domains. Our selection criteria was based in on **choosing models of self-organisation pattern strategies and some models applicable to socio-ecological systems known as SES Resilience**. Furthermore, we decide to focus on already existing applications that could be easily edited and adapted to our exhibition narratives.

The digital design of the automata models will be presented as a circular mask cropping the content in a "microscope" aesthetic.

Sixteen digital models of organic and inorganic spatial organisation strategies will be displayed in the exhibition: **Flocking, Reaction Diffusion, Fractals, Entropy, Polygonal Arrays, Wolf Sheep Predation, Rebellion, Tumour, Branching, Self-Regulation, Turbulence, Grain Growth, Ethnocentrism, Ruptures, Spots & Stripes, and Slime Molds.**

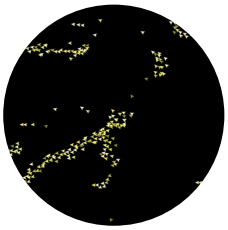
VISUAL COMMUNICATION AND LIGHTING

A general concept text, a curatorial text and additional explanatory texts under each screen, will be presented with dark gray fonts on white wall background, using a "laboratory" aesthetic with adequate size for public reading and translations in required languages.

The spotlights will be installed on the ceiling structure by adequate supporting systems used at Malipiero Palace, and the mood will be deemed as soft lighting directed on the trees and texts.

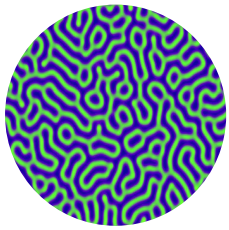
EXHIBITION DESIGN local context

code: ECOSYSTEM



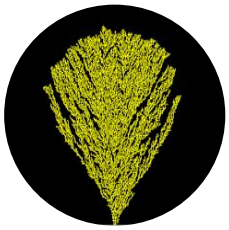
FLOCKING

Flocking is the process by which birds or schools of fish aggregate together. Birds avoid being led by any particular leader by following a set of three simple rules: separation, alignment and cohesion. As a result, the guidance of a simple rule system allows for complex and intelligent navigation.



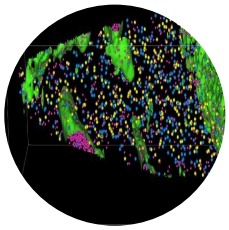
REACTION DIFFUSION

Reaction-diffusion systems represent the transition of a surface from a homogenous state to the occurrence of periodic patterns. Instances of the system are found in biology, physics, geology and ecology. The patterns of crystals, coral, fungi, lightning, animal life and so on can all be predicted by Turing's reaction diffusion system.



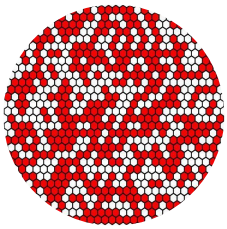
FRACTALS

All throughout nature, there are structures of organisms and natural phenomena that maintain consistent proportions despite massive variations in magnification. They appear not only in plant organisms, but also in landscapes, weather, and the cosmos. Hierarchy of repetition allows outsiders to look into a system and troubleshoot problems based off only a mere fraction of the system



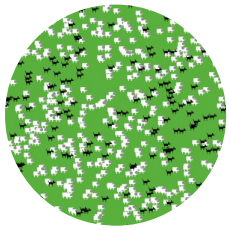
ENTROPY

The second law of thermodynamics states that in an isolated system, entropy can only be increased. Without new energy put into the system, like an unmaintained bridge, the system is eventually destined to collapse. Entropy is the quality defines everything from why paint peels to Murphy's Law.



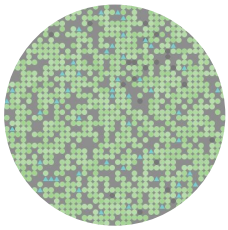
POLYGONAL ARRAYS

Despite not having any blueprint at hand, bees are able to make a perfect economic surface through the use of hexagons. As opposed to squares or triangles, hexagons use the least amount of wall area, and consequently, require the least amount of energy to construct. These patterns are also crucial to the structure of bubbles, butterfly foam, and mineral mesh.



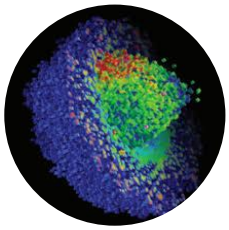
WOLF SHEEP PREDATION

Predator-prey systems operate on the idea of balance. If one of the two goes extinct, the system becomes unstable and results in the extinction of the other half. If the system can maintain itself over time despite fluctuations in population size, then the system is considered stable.



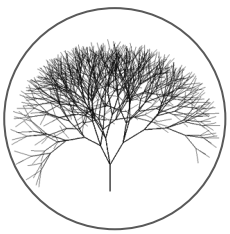
REBELLION

If a central authority obtains too much negative reception and the perceived consequences are low enough, the members of a system form a rebellion. The system is then divided into those for the system and those against the system. Those for the system can be equated to cops, utilizing authority to defend the system. There is math behind!



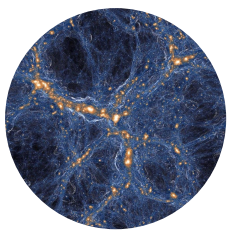
TUMOR

A tumour is comprised of stem cells and transitory cells. The tumour can resist chemical treatment through DNA mutations and metabolic changes despite chemotherapy and other regenerative processes. Cell uncontrolled proliferation generate defined patterns and void organizations.



BRANCHING

Phyllotaxis describes the process of branching around the stem. Branching formations depend on the interaction of four variables: concentrations of the plant hormones auxin and cytokinin, growth factor, and nutrients. The spread of an organism or system can thus be controlled by carefully monitoring its parameters and studying how they affect the system.

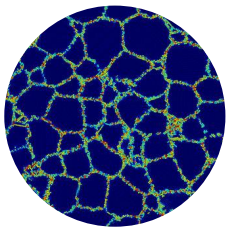


SELF-REGULATION

We can consider the earth to be a self-regulating system that runs off of the laws of physics, chemistry, etc. Every living organism and system are each both an agent of change and a recipient of change. Flowers, for instance, impact climate and are impacted by it. The main idea is that earth is a steady equilibrium, where the total energy in is always equal to the total energy out.

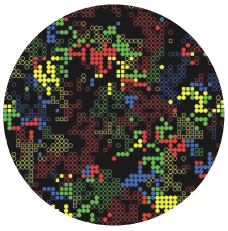
TURBULENCE

The law of least action is relevant in the movement of water down a hill. The same way that a ball will take the the path that uses the smallest amount of action (kinetic and gravitational energy), water takes the path at which it expends the least amount of gravitational energy. The result is a fractal network like that found in a river basin. This logic creates similar fractal networks in mountainscapes, coastlines, lightning, etc.



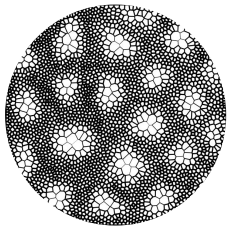
GRAIN GROWTH

Grain growth is the expansion of molecules of a grain when exposed to a high temperature. This system occurs all throughout metallurgy, ceramics, and minerals. The key idea is that once the recrystallization process is complete, the only way of reducing internal energy is by decreasing the grain boundary.



ETHNOCENTRISM

Ethnocentrism is the idea that one's culture is superior to those of other cultures. Behaviour associated with ethnocentrism can occur even without the presence of any local "ethnocentrists". When a market makes decisions with the aim of benefiting one culture, another culture is consequently rejected. Once the health, safety and welfare of the members of a system is threatened, outsiders are villainized and ethnocentric behaviour emerges.

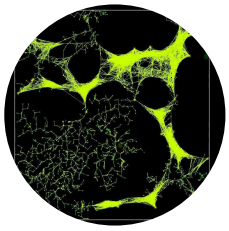


RUPTURES

Decay is attributed to disorganization, but decay is in fact, a huge agent of systemic patterns and structures nature. Cracks can be predicted by analyzing their balance of chance and determinism. A sheet of ice filled with cracks is much more a map of the movement of water beneath it then it is a series of random lines. In the case of drought, the cracks become a map of the tension spots between the shrinking upper dry level above and the still moist layer below.

SPOTS AND STRIPES

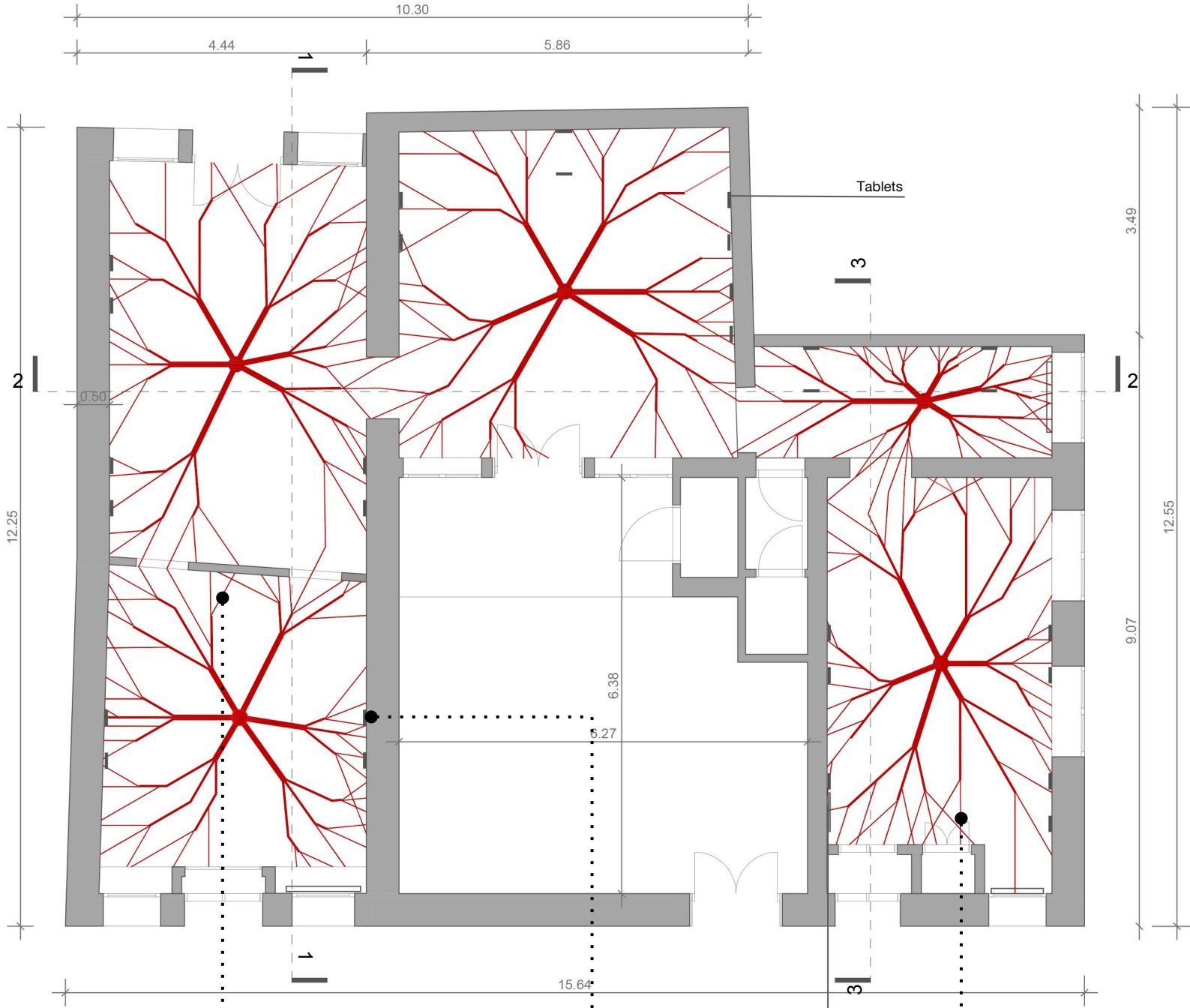
The explanation for the emergence of spots and stripes as a creature grows was explained by Rudyard Kipling as a mathematical one that doesn't depend on biological factors, despite variations as a result of natural selection. Alan Turing deduces that the key to the formation of these patterns is feedback. By describing spots and stripes as stationary chemical waves, we understand that they are a sophisticated system rather than a random phenomena.

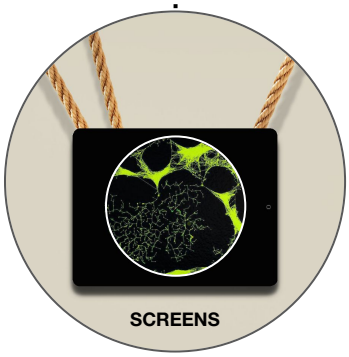


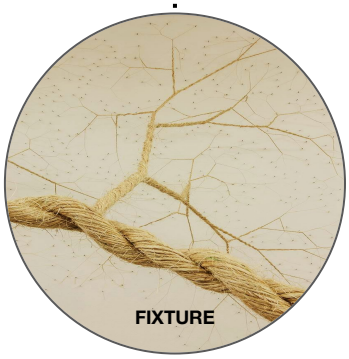
SLIME MOULD

When specific single celled organisms are deprived of food, they congregate together and start acting as one body. All the components are ready to change shape or function in order to survive. Through chemical interactions, the cells of the mould use branching to adjust to circumstance. Slime molds are in great focus of researcher as model for transportation and logistic optimization based on local agents.

PROJECT: PLAN

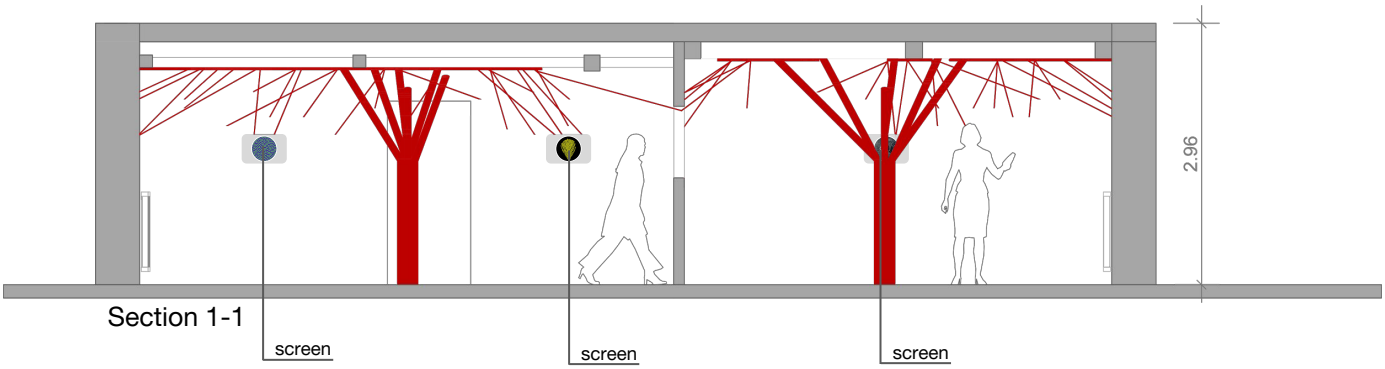




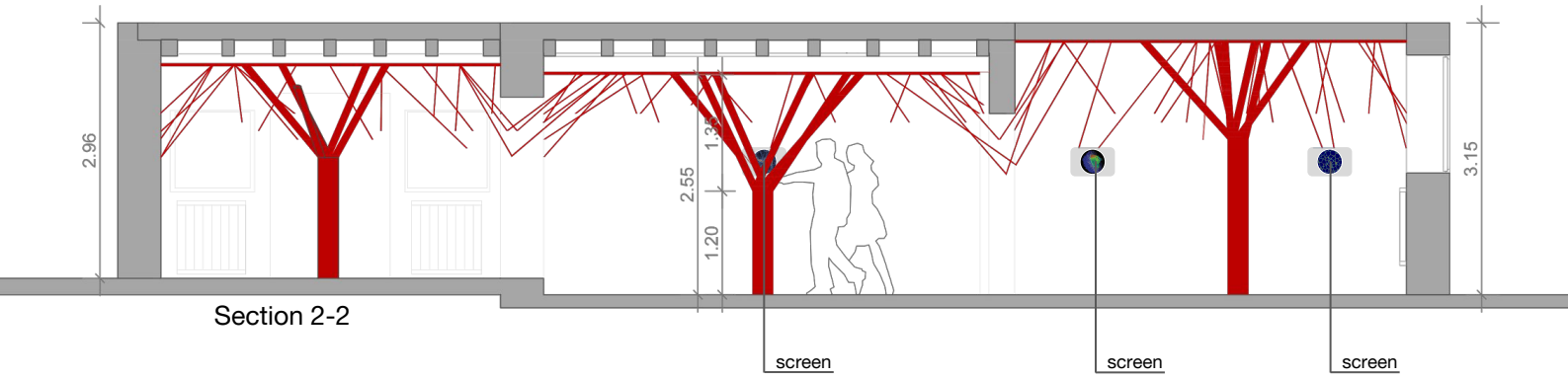


PROJECT: SECTIONS / NIGHT RENDERING

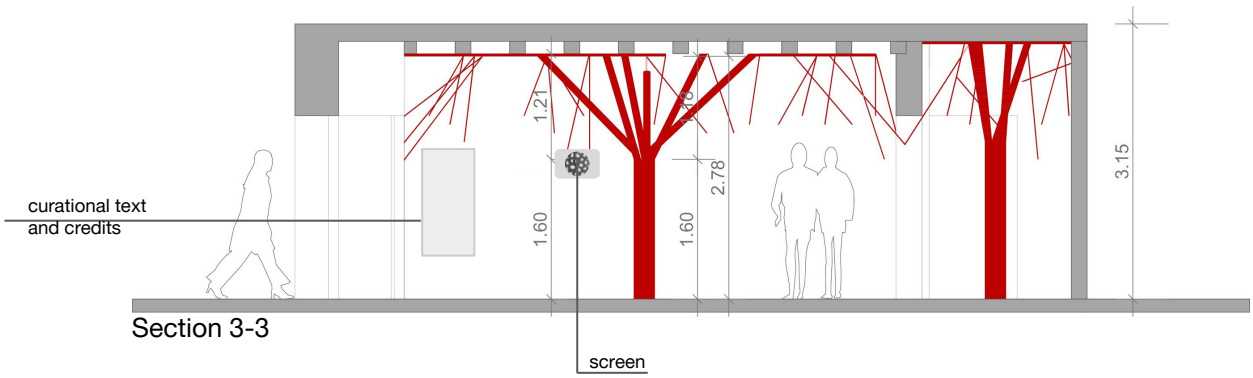
code: ECOSYSTEM



Section 1-1



Section 2-2



Section 3-3

COST ESTIMATION

ITEM	DESCRIPTION	UNITS	COST (€)
ROPE INSTALLATION	Rope tree with respective supportive structures and fixtures on the walls and ceiling	5	6 200,00
TABLETS	Tablets with digital application (organisms simulation)	16	7 000,00
LIGHTNING	Scenographic spotlights	25	2 500,00
VISUAL COMMUNICATION	Exhibition Information text printed in vinyl and fixed on the entrance wall	1	200,00
	Identification of each organism simulation printed in vinyl and placed under each tablet	16	550,00
LOGISTICS	Travel and accommodation for author and team + installation mounting and dismounting + installation transfer to Montenegro upon termination of the Biennalle	1	8 550,00
		TOTAL COST	**25 000,00**