Illustration of a pathway through the Martian "lush savanna" forest. Areas with generous vegetation provide privacy and recreational pathways through "the woods".

Country / City	Finland / Espoo
University / School	Aalto University / Department of Architecture
Academic year	2016
Title of the project	The Marscape Project / A study of adaptable landscape architecture on Mars
Authors	Sanna Sarkama

PERFORMATIVE NATURE

Barcelona International Landscape Architecture Biennial

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Máster d'Arquitectura del Paisatge -DUOT - UPC
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TECHNICAL DOSSIER

Title of the project	The Marscape Project - A study of adapatable landscape architecture on Mars
Authors	Sanna Sarkama
Title of the course	Master's Thesis
Academic year	2016
Teaching Staff	Supervisor: Professor Jyrki Sinkkilä
Department/Section/Program of belonging	Department of Architecture / Landscape Design and Construction
University/School	Aalto University

Written statement, short description of the project in English, no more than 250 words

One of the next steps in Human Space expeditions is to send humans to Mars by the 2020's and 2030's. Even the shortest expeditions to Mars are a few years in duration and permanent settlements are planned to be established in the future. Inhabiting Mars requires carefully designed habitats to ensure human survival. The confinement caused by enclosed habitats and the distance from the Earth emphasizes the sense of isolation. Weaker-than-Earth-gravity, radiation and low light levels have their toll on humans and vegetation alike.

Interaction with green elements and environments improve physiological and psychological health. Green recreational environment could be beneficial for the multiple years spent in demanding physical and psychological conditions on Mars. This thesis studies problems related to landscape architecture on Mars. The main questions are: what landscape architecture would be on Mars and how landscape architecture can help humans to adapt to Mars. These problems are explored through the aspects of requirements of vegetation and humans on Mars, our perception of a space and how green environments can benefit human well-being.

Through the studies researched for this thesis, a concept for an outdoors indoors landscape is presented. This thesis suggests that the landscape should be subsurface, in caves or lava tubes. The concept proposes how different elements, requirements, and limitations can be integrated into the landscape in order to allow recreational and restorative actions to take place. The concept suggests creating a dynamic setting with familiar elements mixed with foreign to ease human adaptation to Mars.

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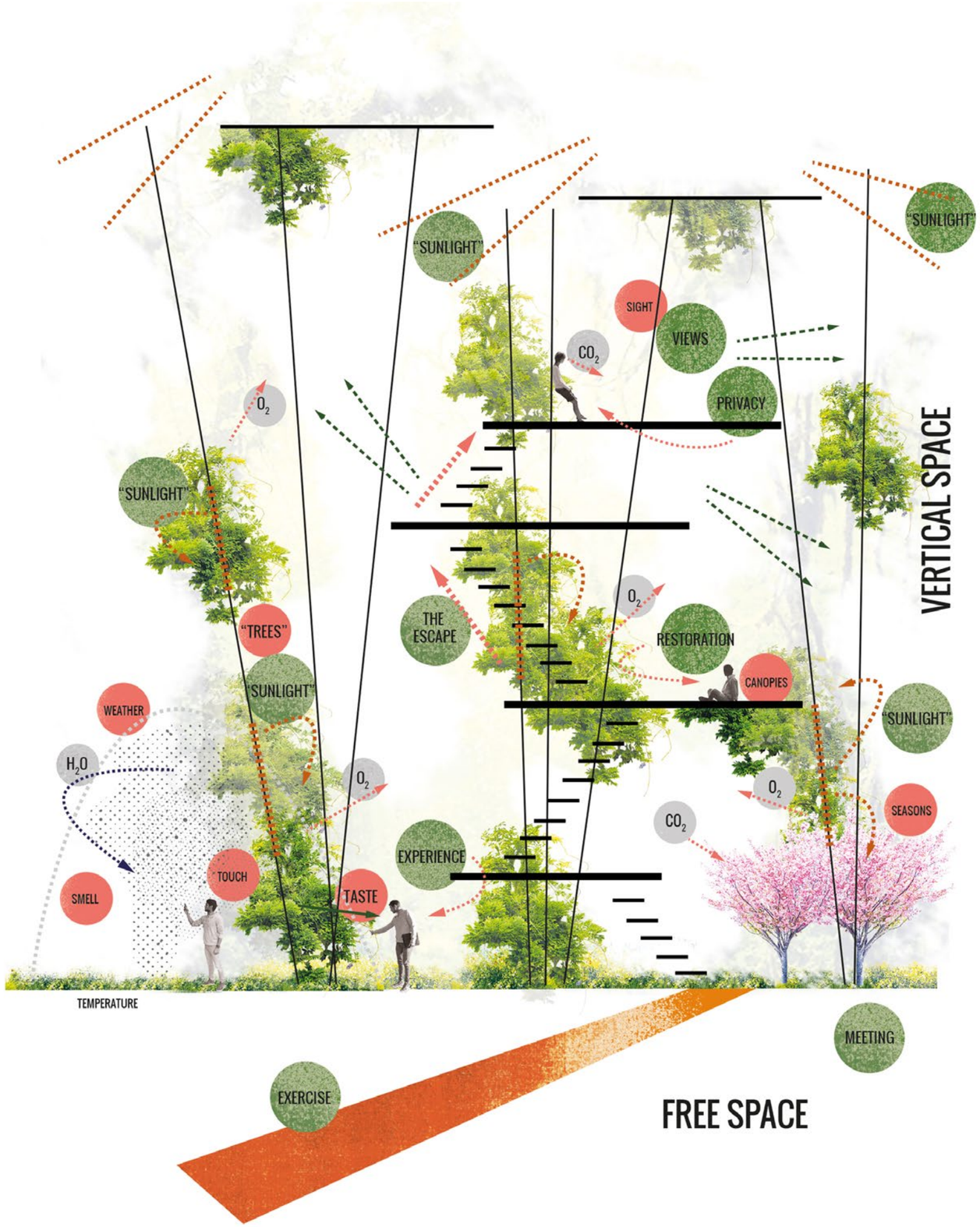
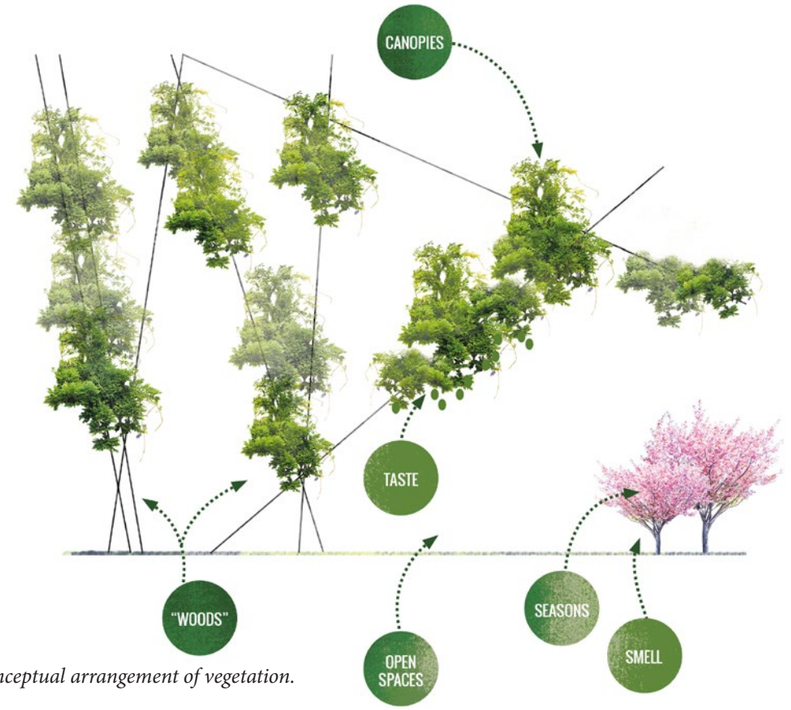
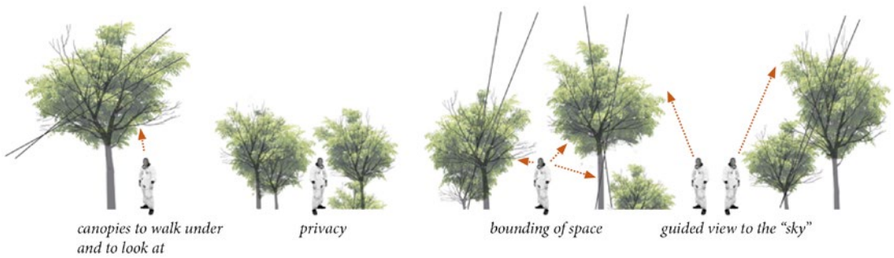


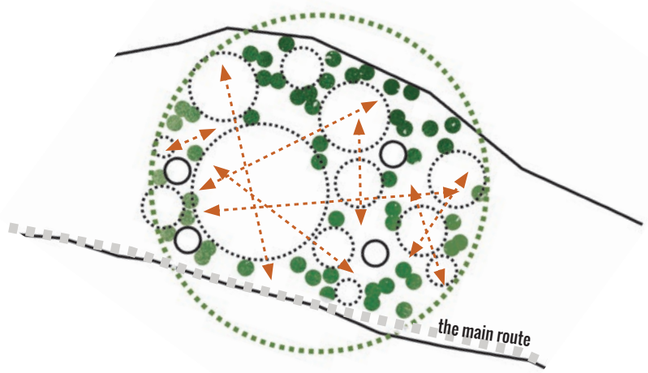
Principles of the outdoors indoors elements of the Marscape. Not in scale.



Conceptual arrangement of vegetation.



Principles of vegetation adjusting space. In absence of large trees the effects can be created by small trees and vines guided by wires. Not in scale. Modified after Robinette (1972, p. 12).



Principles of views through different spaces of the Marscape. Views to bare edges are avoided while views of different lenghts increase the percieved size of the space. Not in scale.

A concept for a northern "savanna" landscape. An open space in the middle of the landscape with "trees" and other vegetation on the edges. Vegetation softens the effect of enclosed edges. "Sunlight" can access the open space freely.

A concept for a space inside a space with mist. Different smells, temperatures or weather conditions can be realized in enclosed transparent "bubbles". Mist of different volumes and temperatures can be used to create "rain".

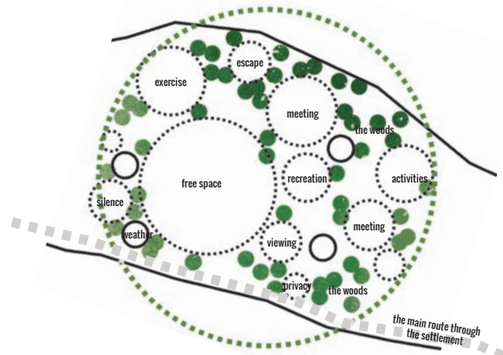
Elements of habitat options on Mars.

	surface habitat	partially subsurface habitat	subsurface habitat
radiation protection	artificial	partially natural / artificial	natural
micrometeorite protection	artificial	partially natural / artificial	natural
max size restrictions	structures, pressure	structures, pressure	insulation, pressure
outside conditions affecting the habitat	temperature changes, weather, dust	temperature changes, weather, dust	none / minimal
complete settlement	network of individual habitats	network of fairly individual habitats	free-formed network of spaces
infrastructure requirements	airlocks to outdoors, transport between habitats	airlocks to outdoors, transport between habitats	access to surface, pressurized spaces subsurface

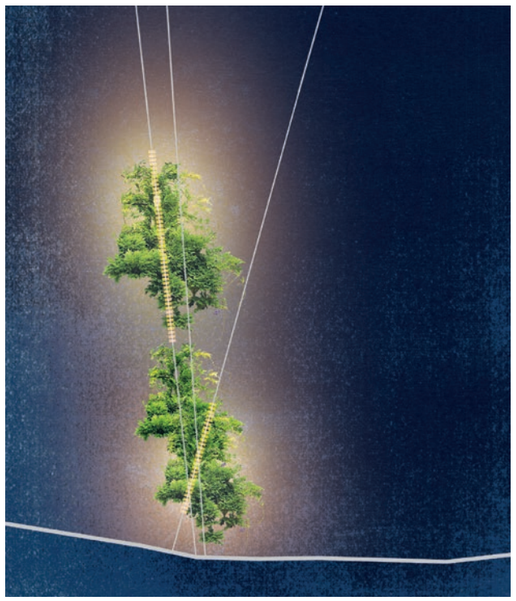
80 m x 100 m

Experiences of different space sizes.

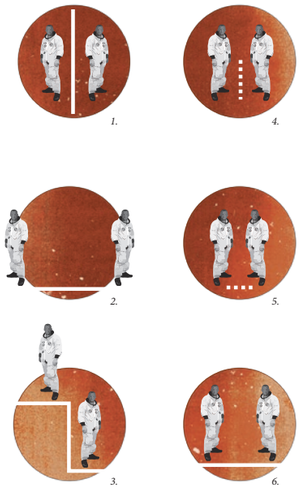
	diameter	experience
escape	2-3 m	views to down below or no views, secret hide-out, intimate
privacy	3-5 m	mostly enclosed, (weather,) observing, cozy
small gathering	5-8 m	some views to other spaces
semi public	8-15 m	some views to and from, fairly open
open	15-50 m	free open space, views to and from



Conceptual space program for the Marscape. Solid circles represent the smaller isolated spaces.



Principles of integrating plant light into the structures.



Effects of physical arrangements on social contact.
Inhibiting contact:
1. Walls, 2. Long distances, 3. Multiple levels.
Promoting contact:
4. No walls, 5. Short distances, 6. One level.
Modified after J. Gehl (Gehl 2011, p. 62).

Illustration of morning light from a skylight. Credit author and Petri Ullakko. In addition to ground level, privacy can be found on different levels The highest level provides a view to a skylight and to the grounds below. While observing from the heights allows views to others, the observer remains hidden as if hiding in a tree.