

POLITECNICO DI TORINO  
SECOND SCHOOL OF ARCHITECTURE  
Master of Science in Architecture for Sustainability  
***Honors theses***

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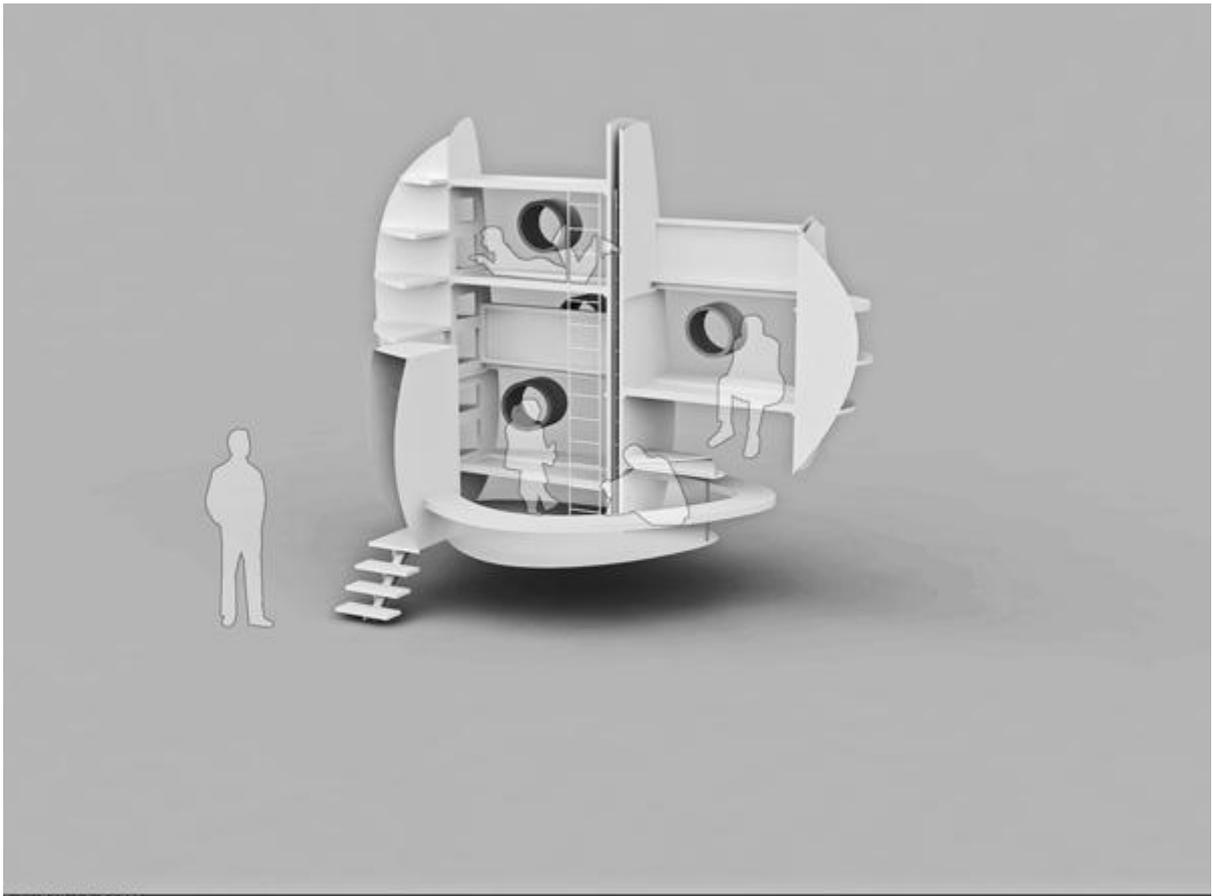
**Biwak\_012. Minimum dwelling in the alps: design of a sustainable bivouac**

by Matteo Muscas

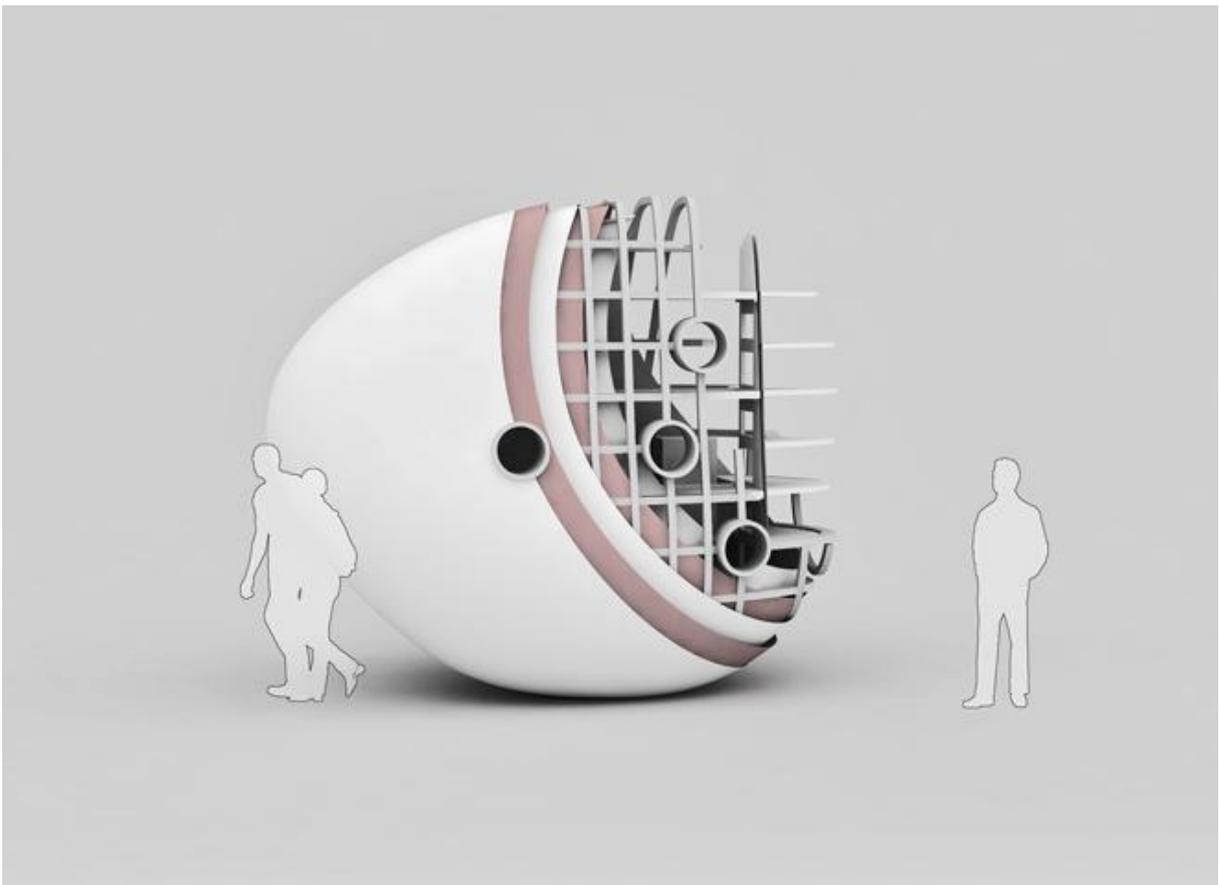
Tutor: Chiara Aghemo

Co-tutor: Carlo Micono

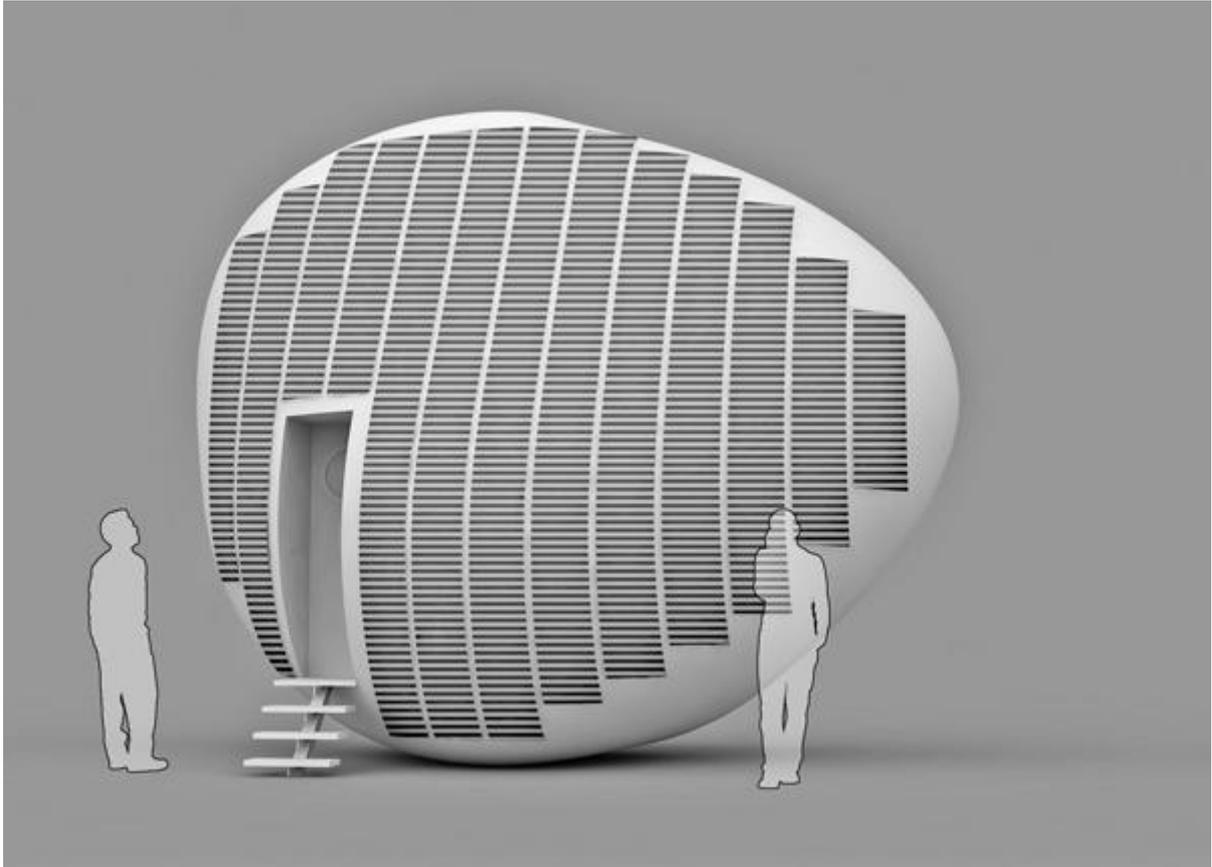
In this thesis work dealing with the project of a bivouac, which is a particular architectural structure that, due to the context in which it is located and the peculiar climatic conditions which characterize the mountain environment, it needs to be completely autonomous able to offer the right "comfort" to mountaineers and hikers. The purpose of the thesis is therefore not only the architectural design of the bivouac or its particular shape, but the project integrated its design technology, evaluated through calculating an "object to living under extreme conditions", which is self-sufficient from an energy point of view and comfortable for users.



Design analysis has begun by the historical study of the different types of bivouacs, all of whom have been designed starting from the end of 1800 to date; later on, through the investigation of three different bivouacs, belonging to dissimilar historical periods, the key needs to be met in the design of the bivouac , and its requirements, have outlined. According to climatic conditions at about 3,000 meters above sea level, and by the users' needs (in terms of frequency and contemporaneity, activities carried out within and kind of clothing) we obtained the necessary data to carry out properly the energy balance of the bivouac. The study then focuses on the shape optimization and choice of housing technologies, in order to ensure the maximum thermal insulation with minimum energy needs.



In particular, the shape, which is designed to integrate the mountain context, as well as respect the ideology of mimesis alpine, fits perfectly to the energy function that bivouac must play.



Through the integration of photovoltaic system and the installation of internal electrical components, which can be used by internal users, we tried to add a dimension to produce electricity in different usage scenarios and different uses of the bivouac, with the same weather conditions. Based on the results obtained, satisfactory from the point of view of the framework of previously identified needs, we developed the study of inner heat balance with different assumptions to use the bivouac. We have, therefore, derived internal room's temperature depending on the number of people inside and the devices that are used, whereas they, along with the daytime sunlight, are the only sources of heat.

For further information, e-mail:

Matteo Muscas: [matteo.muscas@ediliziamuscas.it](mailto:matteo.muscas@ediliziamuscas.it)  
[muscas.stmoscarello@gmail.com](mailto:muscas.stmoscarello@gmail.com)