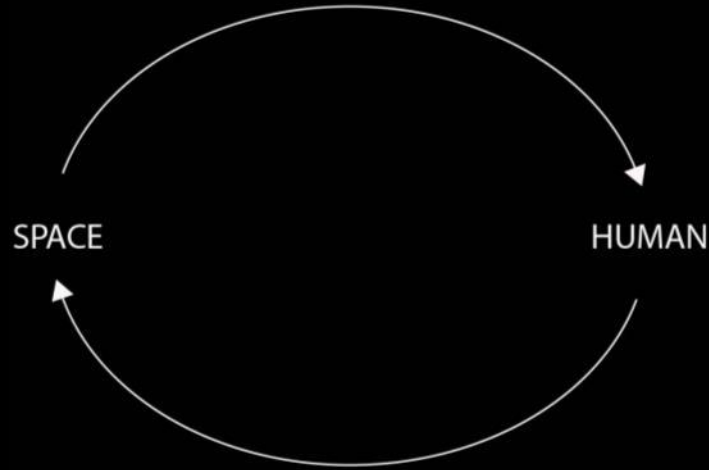
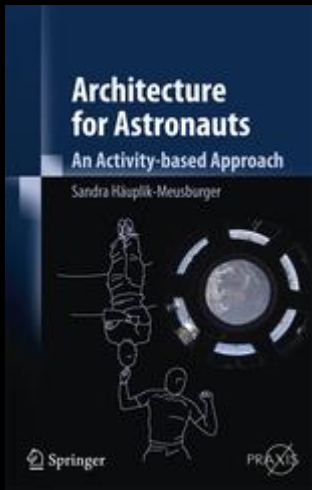


Space Habitats and Habitability

Sandra Häuplik-Meusburger



Online:
<http://issuu.com/hochbau2/docs>

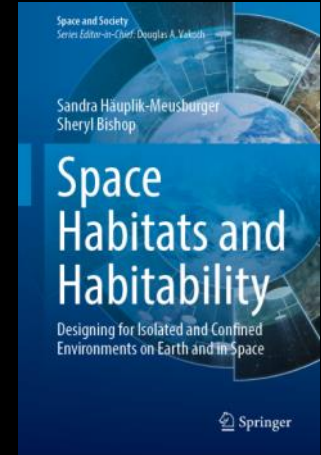


The view from psychology

Who are the best people for a space?

The view from architecture

What is the best space for a place?



HABITABILITY IN SPACE STATIONS

By

Stanley C. White*
John H. Reed, Jr.**

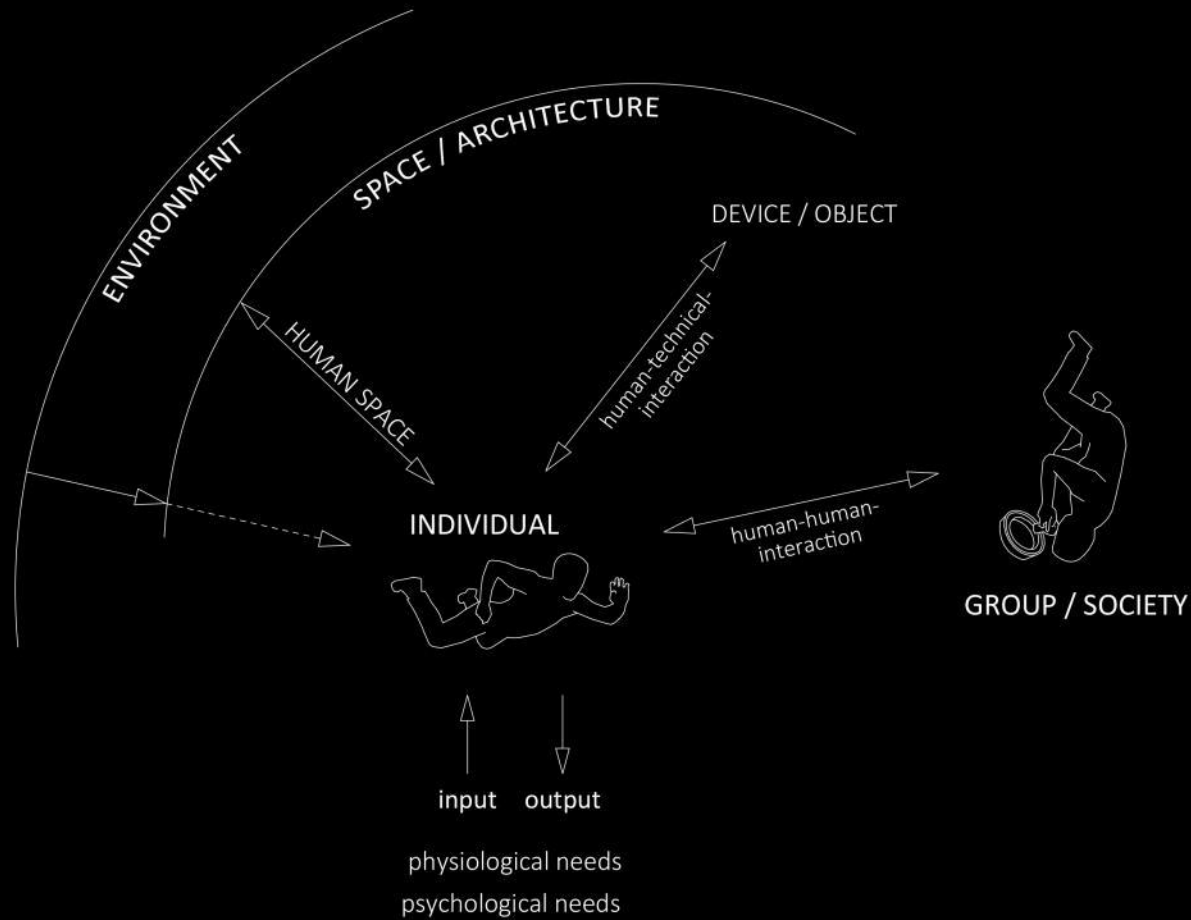
INTRODUCTION

What does habitability mean? This word is commonly used and is bandied about as a thing which is necessary and desirable for all manned flight vehicles. But what does it really mean?

A serious examination of the meaning of the term soon leads to attempts at definition into discussions of the interplay of such factors as the mission, the size and makeup of the crew, the jobs within the mission, the flight duration, the stress loads, the vehicle to be used, the comfort, and the deprivations inherent in the mission, the flight environment, et cetera. In other words, habitability might be considered the resultant of the interplay of all of the factors related to the man, his machine, his environment, and the mission to be accomplished. It is more easily visualized as the state of being at the completion of the interaction of all of the factors rather than a discrete entity itself. Therefore, the provisions made to meet the habitability requirements can contribute to or be detrimental in meeting the program objectives. The requirement placed upon the space vehicle may be eased if necessary through the proper selection and training of the crewmen. The motivation of the crew may be an additional aid in providing a satisfactory solution to the habitability needs. The design and development of the space vehicle should avoid depending upon special selection and unusual training to meet the basic provisions needed to support the men in the space environment. The vehicle provisions should stand upon their own merit. Difficult and hazardous missions can be made more tolerable through augmentation of the provisions for habitability. For the sake of this discussion of habitability in a space station,

HABITABILITY

HUMAN FACTORS



From Space to Place ... How to evaluate ?



credits: NASA /MSFC, Norwegian National Library (photographer: Fridjof Nansen, Dorin Prunariu, Alexey A. Ekaykin)



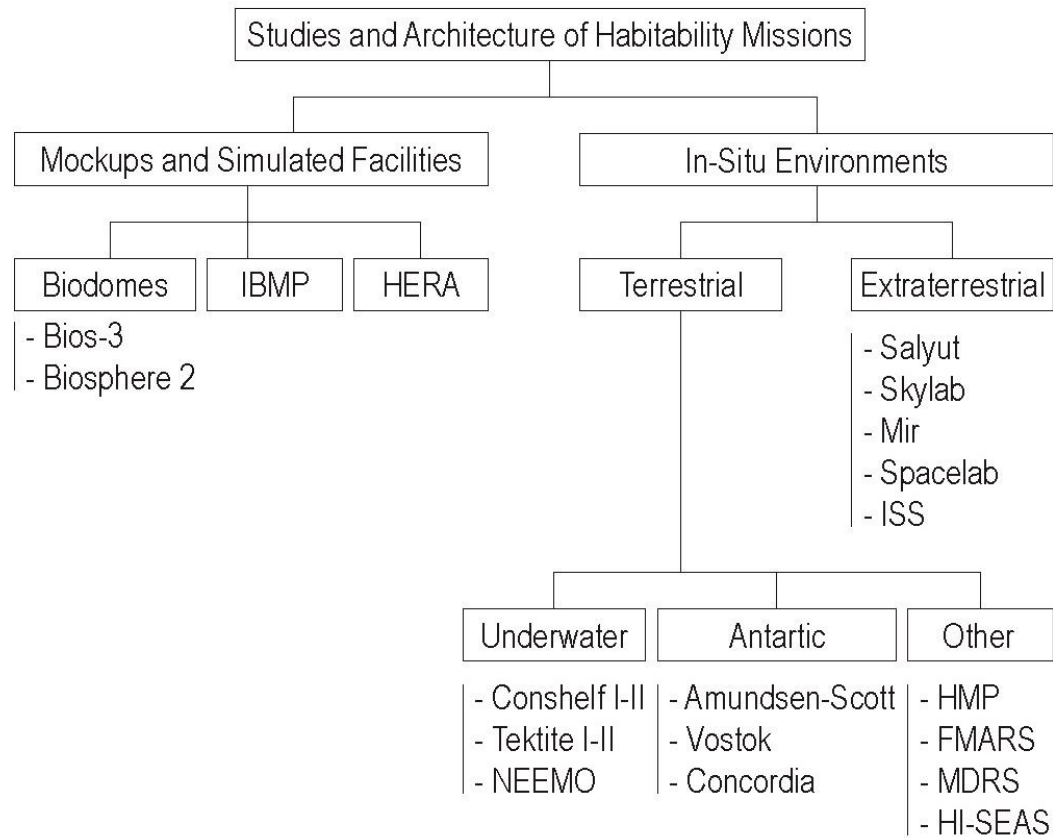
credits: NASA



... we must remember that **how people experience an environment** is more important, than the objective characteristics of the environment (Suedfeld and Steal, 2000)



credits: NASA



Colour code

Sleep

Hygiene

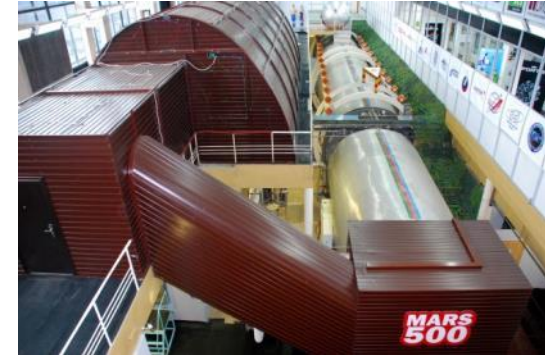
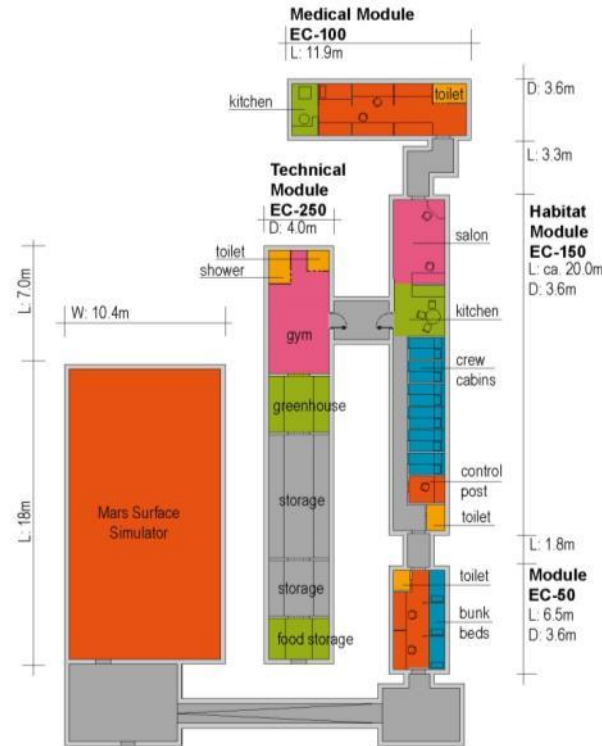
Food

Work

Leisure

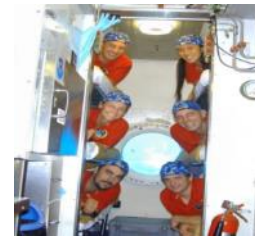
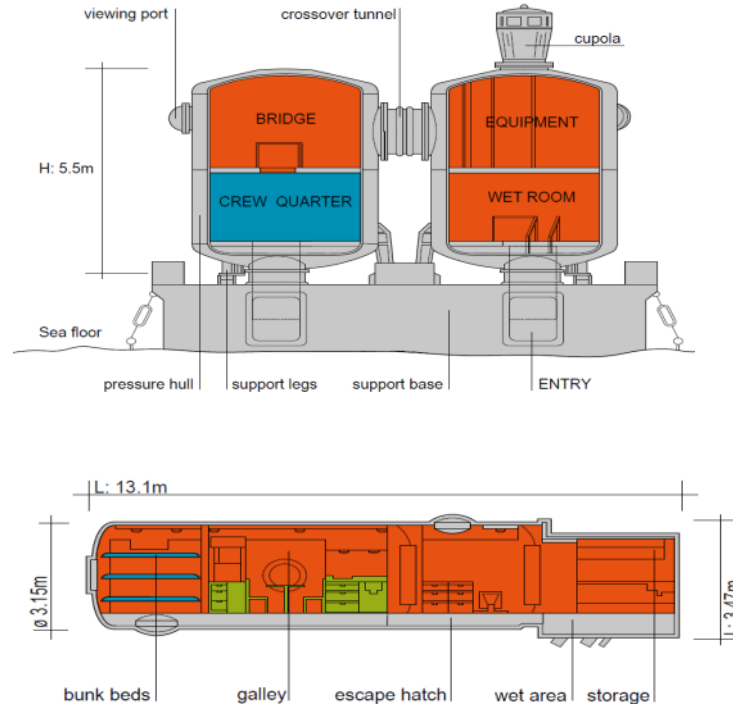
Chamber Research Facilities

- Semi-Closed loop environments
- Conducted in the safety of larger facilities
- Lack true risk
- Lack true isolation
- Represent confinement
- Good testbeds for equipment and processes
- Focus is on functionality
- Lack of danger/risk and isolation limit utility



In-Situ Research Facilities

- Residential habitats
- Focus is on survivability AND habitability
- Situated in 'real' environments
- Provide greater isolation and confinement
- Provide greater risk and danger
- Provide greater demands for crew autonomy
- Provide greater test of realistic conditions for equipment, processes and group dynamics



UNDERWATER RESEARCH FACILITIES: The Tektite habitat in 1969 with the aquanauts. TOP (credit: OAR/National Undersea Research Program - NURP) BOTTOM: NEEMO 11 crewmember works near the undersea habitat "Aquarius" during a session of extravehicular activity (EVA) for the NASA Extreme Environment Mission Operations (NEEMO) project (credit: NASA) . **NOTABLE MISSION:** The first NASA all-female crew (Mission 6) occurred during Tektite II in 1970 with Sylvia Earle in b & w suit. (credit: OAR/National Undersea Research Program - NURP) - MIDDLE PHOTO

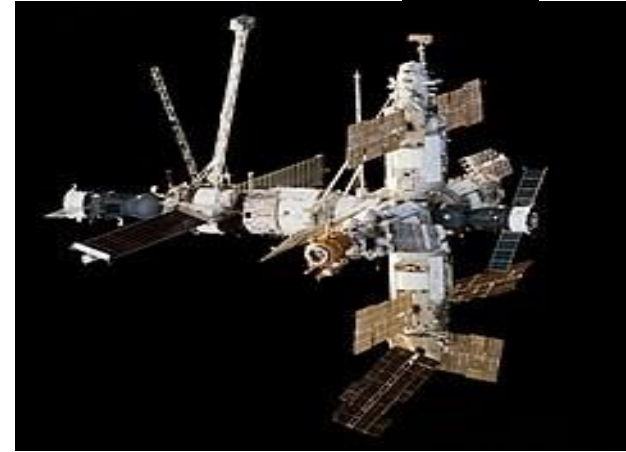
Space Facilities

Salyut-7



- Small crews
- Non-representative demographics
- Different national programs
- In LEO

Mir



Skylab



ISS



Can we Build THE Perfect Habitat?



Projekt Tube of Eden – A. Garber, K. Lehr-Splawinski

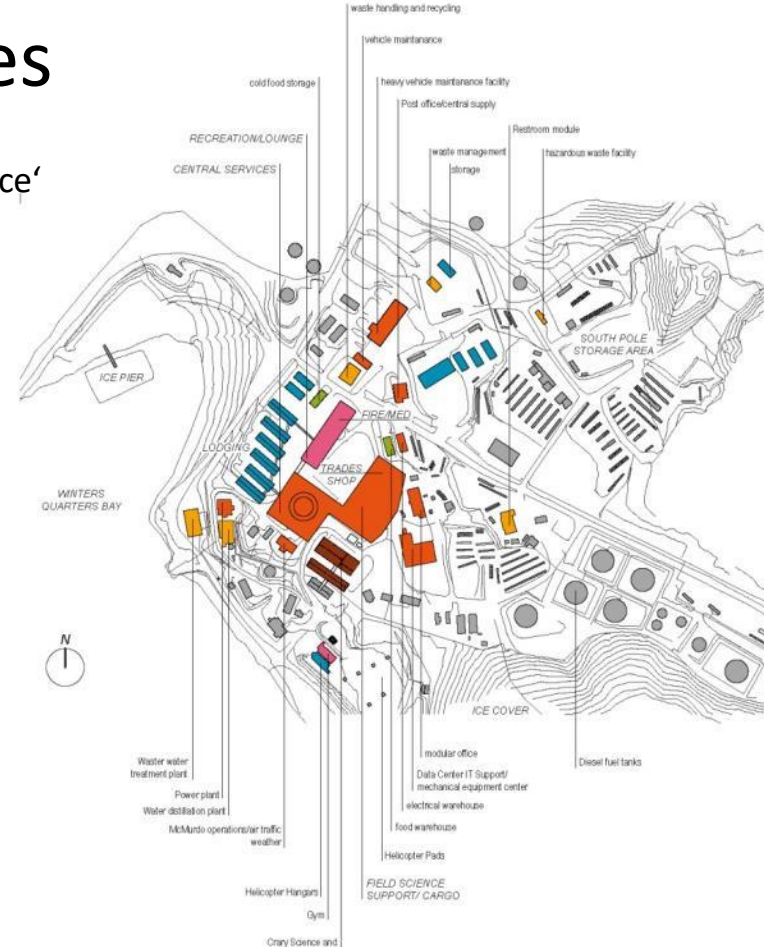
Technology is the answer ... but what was the question?

(borrowing from Cedric Price, 1966)

- (1) **Are there factors?** related to Earth's natural conditions that are needed / vital for human well-being in ET and EE Habitats?
- (2) **If so, what are the characteristics** and dimensions of those that need to be surrogated?
- (3) And which technologies and socio-spatial strategies are available to do so? ... Multiple Solutions ...

Making the most of all resources

[Theme 3] Less social time together over time > create more social ,space'



A supply storage area at McMurdo Station in 2014
(credit: Elizabeth Mockbee, USAP, NSF)

Space Roommates – Social Logic of Space

When the need for privacy becomes a territorial issue

Zoning out social conflicts -When Little Things become Big Things

Love goes through the stomach, fine manners help

Friendship, Intimacy and Sex

Preventive measures, mitigations measures, multiple opportunities



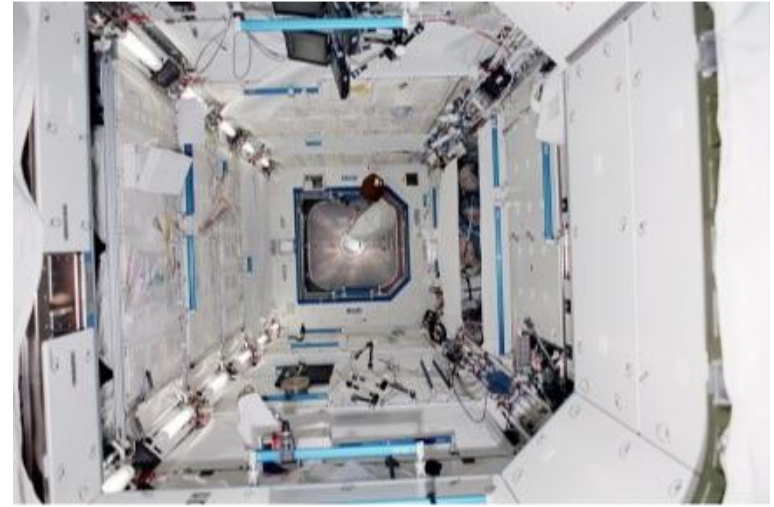
Eating together onboard the ISS. ISS Expedition 61 crew in the Zvezda Service Module for a New Year's Eve meal on December 31st, 2019. **13 Sleeping in a Box.** Three STS-107 crewmembers are pictured prior to their sleep shift in bunk beds

Looking out and Looking in: What makes us feel confined?

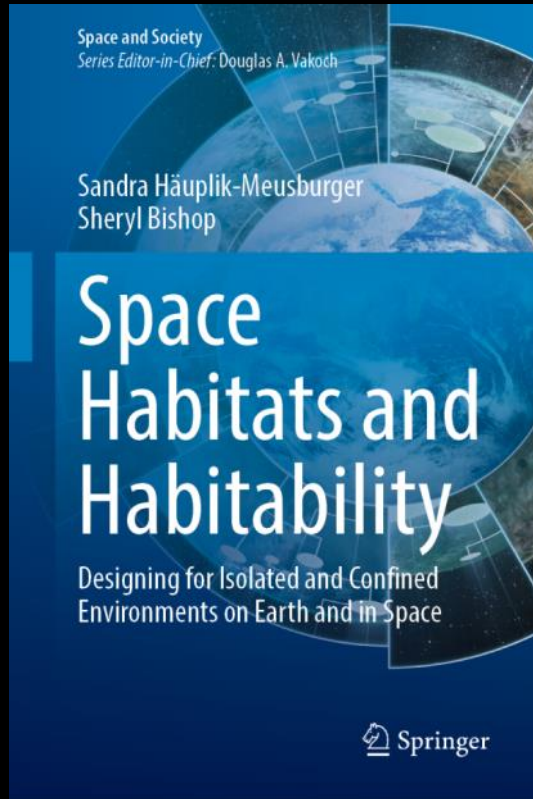
Crowdedness: too much, too close!

Lack of stimuli: Monotony and Boredom

All approaches that contribute to perceptions of spaciousness, novelty, change, variability will serve to counteract perceptions of confinement.



Destiny Laboratory in 2001 soon after arrival and in 2020 with Expedition 62 Crew (Credit: NASA)



*„It’s not how large you make it,
its how you make it large.“*

Sandra Haeuplik-Meusburger
haeuplik@hb2.tuwien.ac.at
www.space-craft.at
Instagram: spacecraftarchitektur

<https://www.springer.com/de/book/9783030697396>