Back to the Future: Challenges of Experimental House Projects designed for Future Scenarios

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Abstract: Prediction of new ways of living is repeatedly used as unlimited inspiration for architectural design through history. Narrowing down the range of the research in order to understand the flux of historical ideas for future living, we focused on the design of domestic environments imagined for various future scenarios and challenges. The aim was to create a clearly cross-examined overview of projects of houses dating from 1927 to 2009 by extracting and defining their aims, strategies and imagined future scenarios. We endeavoured to present the breakthrough radical designs, but also a series of Japanese capsule drawings. The focus was on compact and transformable spaces. Speaking of the concept of 'home of the future', its breakthrough showed up as a result of the twentieth-century revolutions and wars, with the birth of new after-war societies and their new needs; as a result of industrial and technological revolutions and as a result of architects 'eternal intrigue for tomorrow. The birth of television had been defining our living spaces from 1940s until the arrival of internet overtook that role. The 'press button 'fantasies induce creation of labour-saving designs, which is nowadays realized in fully automated smart houses. The mobile houses marked 1960s and 1970s. However, the sci-fi imagination from the movies in the same period also directly inspired configuration of 'smart 'houses. Dramatic growth of population throughout the whole twentieth century made various space-minimising and flexibility-maximising strategies. On the contrary, many alternative projects activate emotional and psychological realm through surreal, idyllic and natural and dreamy shapes in homes. After all, we can say that our contemporary notion of domesticity appears through self-sufficiency, mini living, nomadism and efficiency. The 'future 'preoccupation triggered some meaningful exhibitions, articles and books that gave the overview for published projects within this topic.

Key Words: experimental housing, house of the future, radical design, Japanese metabolism, mobile house.

Introduction: Back to the Future

The concept of the future has consistently been a central theme throughout the history of architecture. Therefore, we begin our exploration of design projects for 'houses of the future' from 1927, traversing through to the imaginative ideas of 2009. Our intention is not merely to trace a timeline but to immerse ourselves in the aspirations, strategies, and speculative scenarios that have shaped our conceptions of domestic space. This journey is a poetic exploration of the imagined homes of tomorrow, asking not just where we have been, but where we are going and how our project fits within these visions of future living environments. As we delve into this world of radical design, we encounter not just innovative breakthroughs but also the playful yet precise explorations of Japanese capsule living—tiny, transformable spaces that redefine compactness and flexibility. This focus on modularity and adaptability speaks volumes about the evolving needs of societies, especially in times of upheaval. The 'home of the future' often emerges as a product of twentieth-century revolutions, both social and technological. Wars reshaped societies, creating new demands for living spaces.

The industrial revolution reimagined production, while technological advances promised to reconfigure daily life. Architects, ever intrigued by the possibilities of tomorrow, grappled with these challenges. The birth of television in the 1940s altered our domestic landscapes, reorganizing furniture and family dynamics. Yet, it was the advent of the internet that would truly transform how we conceive of space—ushering in an era of automation, smart homes, and "press-button" fantasies once seen only in science fiction. The 1960s and 1970s saw an explosion of mobile houses, reflecting the growing nomadism of society, while science fiction films from the same era directly inspired the designs of smart homes. Yet, even as technology advanced, population growth throughout the twentieth century forced architects to consider strategies of minimization and flexibility.

In understanding the flux of historical ideas about the future, we are led to stories of architects designing domestic environments for new times, not with mere freewheeling imagination, but always with a sharp awareness of the challenges. From 1927 to 2009, we ask: what problems did architects select as key? How did their designs

respond to these challenges, from post-war reconstruction to environmental crises, to the demands of the digital age? Throughout this period, exhibitions, articles, and publications have chronicled these visions of the future. Landmark exhibitions like “The House of the Future” (1956) at the Ideal Home Exhibition, and publications such as "The New Domestic Landscape" (1972), and more recently "Living in the Future" (2010), have provided a platform for presenting and analyzing future domestic environments. These exhibitions offered a representation of not only the prevailing architectural ideas but also the predictions of how we might live—compactly, sustainably, and in harmony with the advancing tides of technology and shifting social structures.

Projects

A journey through the transformative and radical design visions for the ‘houses of the future’ from 1927 to 2009 is the foundation and main source of the research. The idea was to encompass as long period of time as possible, to select projects which have strongly determined and clear concepts, principally compact or minimal dimensions, and substantially original and fresh designs oriented towards further imagined future. By examining these projects, we aim to unveil the ambitions, strategies, and imagined scenarios for future living environments. The vision of the home as a futuristic concept has been shaped by societal revolutions, technological advancements, and the relentless curiosity of architects. These visions were not simply flights of phantasy but responses to pressing challenges, marking profound shifts in the ways we conceive of contemporary ways of living.

Glass House, Sergei Eisentein, 1927

Russian film director demonstrated the fact that architecture is not only theoccupation of the architects, but that it is involved in big social questions. Eisenstein’s conception asks the real question of the modern world: can we really deal with transparency? Mies Van der Rohe’s and Bruno Taut’s glass architecture, as well as Lang’s vision of the city in 2000 in film Metropolis, pushed Eisenstein to present his response in a 24 min long movie Glass House. He simply showed the life of residents in a skyscraper with floorsand walls of clear glass. His tool was deconstruction of traditional architectural frames, mainly in the terms of building privacy. The definition of privacy here lays on two ‘mythologies’- the hierarchy of structure of the skyscraper and the glass with its essential feature—transparency. Anyway, the script exists only as a storyboard in the archive, because it was never completely finished because of Eisenstein’s psychological doubts, although he already had the deal with one company in Pittsburgh for the material and construction of the building for the film.

Figure 1. Glass House, 1927 (Source: Sketch by Authors)

House of the Future, Alison and Peter Smithson, 1956

House designed for ‘childless couple from the future’ with its full-scale model was exhibited at the Daily Mail Ideal Home Exhibition, March 1956 in the Olympia Exhibition Centre. Their concept of future was expressed through fully mechanised furniture. The intention was to bring about a theoretical discussion, it has never had the purpose to become an actual product. The house was surrounding the central courtyard that provides natural lighting and makes private outdoor space, while plane facade with only few openings making the possibility

to place houses in side-by-side. Large open space for living was not covered by roof in order to allow to the visitor to climb the platforms on the sides of the model and observe this open plan with cubicles which stored hidden appliances.

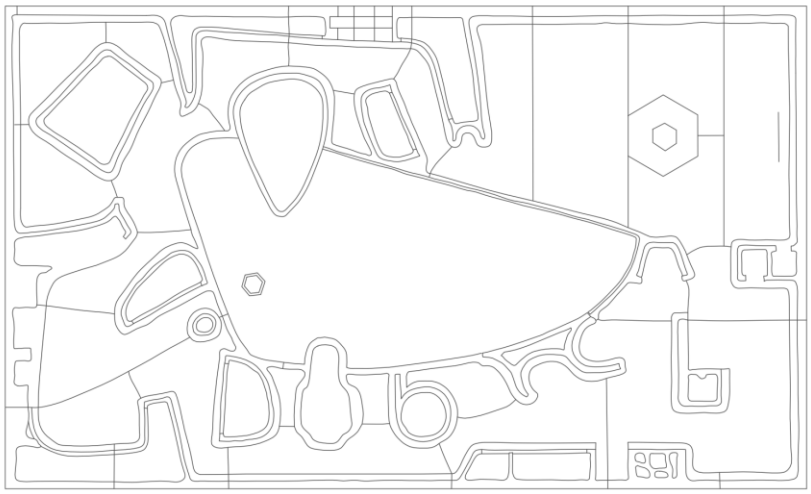

Figure 2. House of the Future, 1956 (Source: Sketch by Authors)

Move net for Skyhouse, Kiyonari Kikutake, 1958

In 1956 Kikutake's project of the shoeboxes that were fixed outside of each window was his prototype for the version of the capsule 'the move net'.This was an improvised solution for the lack of space considering the arrival of children and the extension of the family. In 1958 Kikutake's concept of transformability is to hang the first of three move-nets to the underside of his new project. One elevated volume building with open floor plan turned down the functionalism. In this way, the Sky house can be expanded with volumes plugged on the bottom and removed when the children have outgrown them.

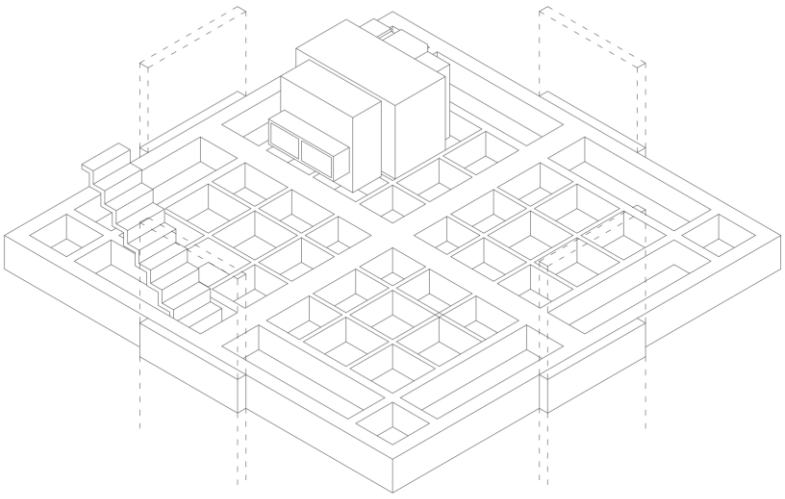

Figure 3. Move net for Skyhouse , 1958 (Source: Sketch by Authors)

Box type apartments, Kisho Kurokawa, 1962

Kurokawa's first capsules were his Box-type Apartments, an idea that came out from prefabricated housing factories in Leningrad and Moscow. They differ based on which one of four kinds of capsule's occupants, whocan personalize the configuration according to taste and their needs. Afterwards, they could be extended with the shrinkage of their family.

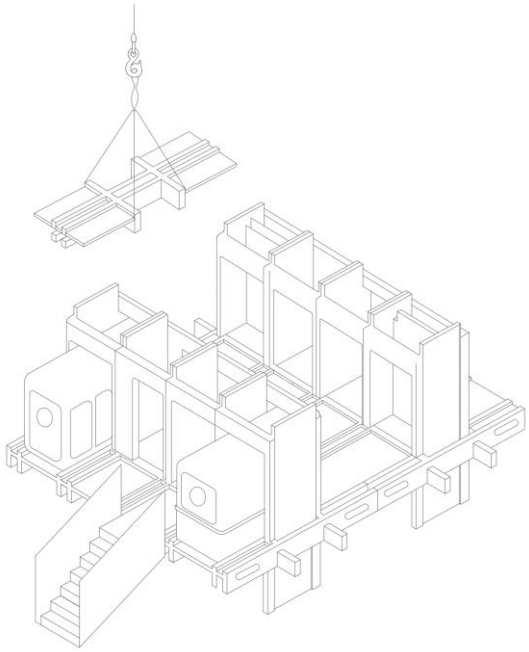

Figure 4. Box type apartments, 1962 (Source: Sketch by Authors)

Plastic ski lodge, Kenji Ekuan, 1962
The project presents a portable capsule ski lodge, that can be deposited on a mountain or any other destination in nature. It could accommodate four pioneers. The capsule was transported on a truck. It was already equipped and ready for moving in. This project is an example of Ekuan's architectural work, but at the same time, he was working on different scales, from single object to the scale of the whole city. Nevertheless, seven years later he repeated design strategy for Yadokari Hermit Crab Capsule Lodge. It was a mobile house perched, on top of a hill. The idea was to move around like a truck. This countryside version of the capsule was designed three years before Kurokawa's rural one, which could be an inspiration for his project.

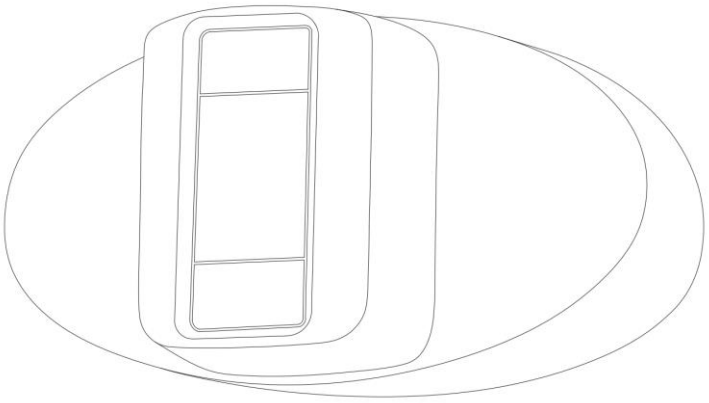

Figure 5. Plastic ski lodge, 1962 (Source: Sketch by Authors)

Pumpkin House, Kenji Ekuan, 1964
This house was initially designed for a couple. Therefore the Pumpkin House has "organs" that swivel around a core "skeleton" in which the main units ofthe house are. It is able to feature outdoor space and even expandable to include a mini-capsule for a child. In the perspective of Ekuan's work, the Pumpkin house stepped out in the scale, which is increased in comparison with previous capsules. Although it is designed for a couple, there is an option to expand it with a mini-capsule for one child and also feature of outdoor space.

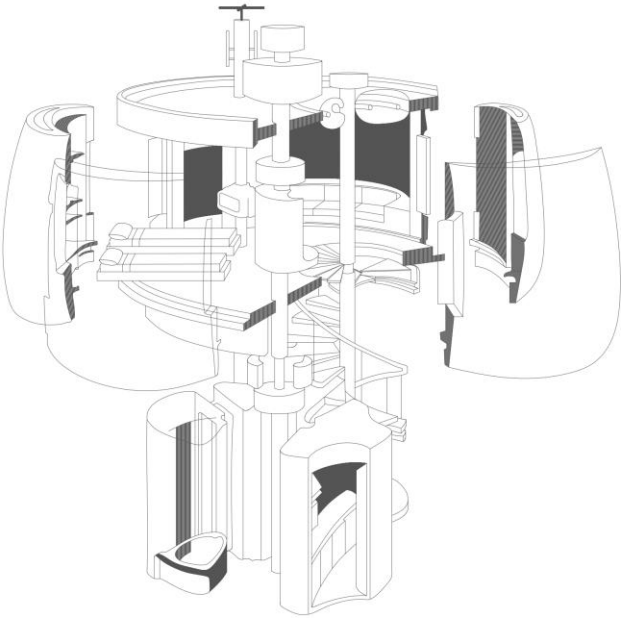

Figure 6. Pumpkin House, 1964 (Source: Sketch by Authors)

Furniture House, Kenji Ekuan, 1964

Kenji's "Furniture House" is the result of a series of experiments on the creation of domestic space through movable furniture, based on the idea of Metabolist furniture. Each unit is equipped with a structure of "skeleton", "organs" and "skin". The house is not defined by walls but by the composition of furniture, which separates and organizes the space in diverse ways. This way was predating of almost ten years the experimentations of European and Italian radicals, as the pieces exhibited at 1972's "Italy, the New Domestic Landscape".

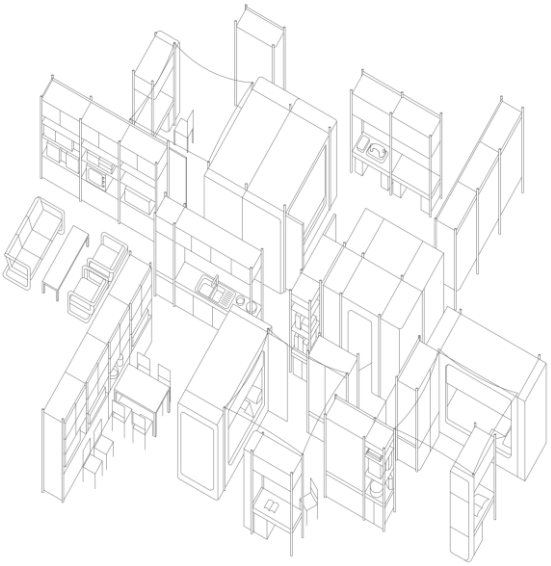

Figure 7. Furniture House, 1964 (Source: Sketch by Authors)

Total Furnishing Unit, Joe Colombo, 1970

"*The future as seen from the past and the past as seen from the future*". The necessity of the owner made Colombo create the array of different domestic scenarios. The house became a system of combined retro style and future techniques. Seamless compact design held a bedroom, a bathroom, a kitchen, hidden cupboard and dining table. All of domestic necessities could be shifted and used and put back in place. The lighting on the top of the unit plays the part in sustainability because the architect used old lights collected from abolished cars. White, silver, yellow and white depict the combination of two eras: future and contemporary. Flexible self-contained pods show the shifts in user's needs and behavior. We can read them through disposition of functional furniture units.

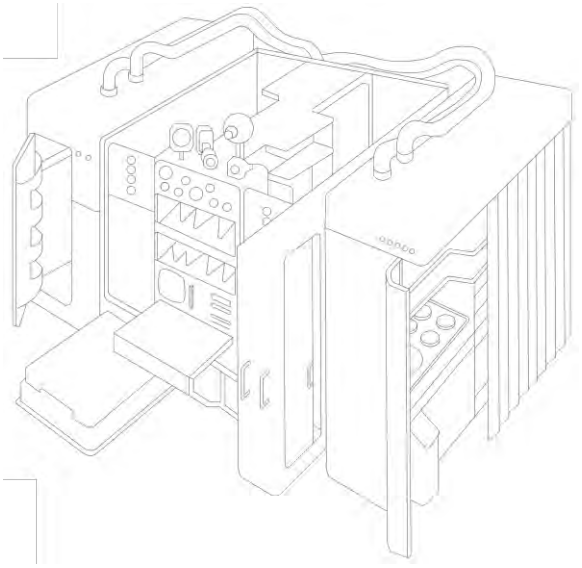

Figure 8. Total Furnishing Unit, 1970 (Source: Sketch by Authors)

Micro Environments, Ettore Sottssas, 1971

Driven by the idea of Italian radical design, Ettore Sottssas tended to create the set of different domestic scenarios especially suitable for each individual user, overcoming the old idea of the house as way of presenting one's wealth. Plastic grey containers are grouped in wide range of ways, composing a network with sliding wheels and plastic cables for reciprocal linking of units. This image of new domestic environment is a set of containers with certain functions: wardrobe, shower room, library, reading room, a stove for cooking, refrigerator, the juke-box. All the arrangements of linking the units or even removing some of them, create the catalogue of options where anyone can define own space according to his own culture, habits and decisions. At the end, each environment presents how people reflect personal feelings through the choice of containers/furniture in their living space.

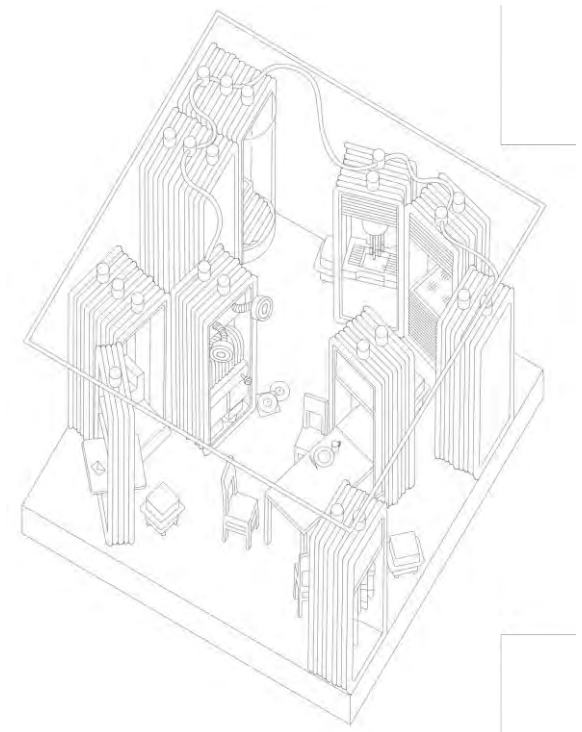

Figure 9. Micro Environments, 1971 (Source: Sketch by Authors)

2010 Living in the Future, Geoffrey Hoyle, 1972

As back in 1972 2010 was the distant future designed in science-fiction writer's picture book. He questioned basic elements of the house. Similar as in Telematic House of Ugo la Pietra, screens are the interface between

the world and the person. Here, Hoyle named them “vision desk” and “vision phone” together with other predictions like small planes function like buses, electric car, which is ‘transported to you from the factory via futuristic pipes, filled with a nonspecific “special liquid’. Specifically for the home, the prediction says that the floor defines everything. He describes the house:

‘In the year 2010 you do not sleep in a bed. There are no beds, no tables, no chairs. The floor is made for sitting, sleeping and walking on. It is soft whereyou sit or sleep, hard where you need a table or desk. Your home is carefully planned. No family lives in a house or apartment too large or too small forthem. Every room has several uses. The bedroom is also an office, and the kitchen is a living room. In 2010, there are so many people in the world thatevery inch of the ground must be used correctly’. (Hoyle, 1972)

His inspiration lays in the belief in technological progress which would allow people to rationalise the space and maximize the efficiency.

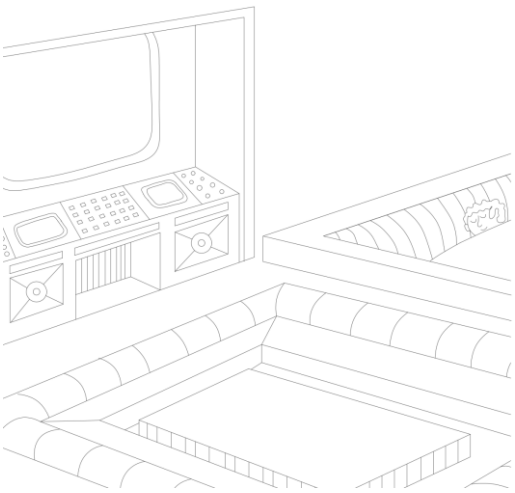

Figure 10. 2010 Living in the Future, 1972 (Source: Sketch by Authors)

Nakagin Capsule Tower, Kisho Kurokawa, 1972

The Nakagin Capsule Tower is the world’s first capsule architecture built foractual use. The 140 capsules are hung on the concrete towers that contain the vertical communications. Their construction is identical, and they are prefabricated steel cells. Inside they are equipped with a bath unit, conditioning system and colour television. It is completed with all necessary appliances and furniture, from the audio system to telephone, but it can also be redesigned according to user’s wish. The main idea of Kurokawa was to develop the technology for installing the capsule units into a concrete core with only four high-tension bolts, as well as making the units detachable and replaceable. The capsule is designed to accommodate the individual as either an apartment or studio space. On the other hand, adding new units and connecting them together, they could also accommodate a family.

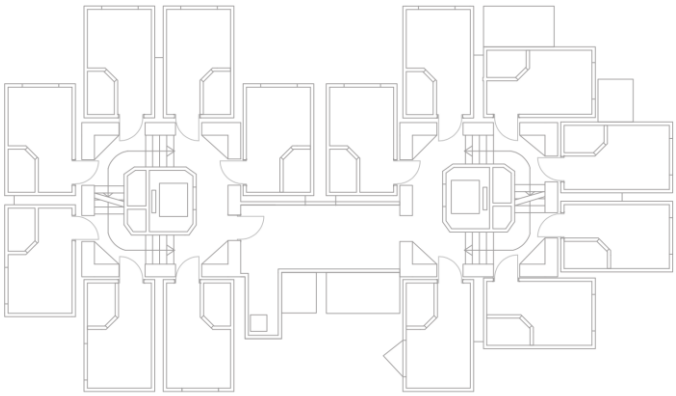

Figure 11. Nakagin Capsule Tower, 1972 (Source: Sketch by Authors)

House for a helicopter pilot, Jan Kaplicky, 1979

British architectural and design practice Future Systems, starting from 1979, has been experimenting with constructions from other professional fields and adapting the methods from aircraft, boat and car design. Jan

kaplicky's House for a Helicopter Pilot was the pioneer house made as a critique of conventional ideas of what a house 'has to be'. He decided to present it withthe strength and intelligence of machinery and precision of mechanisms.The house itself is twentieth-century mutation of domesticity because of its roof-top landing deck, built-in solar collectors, interiors inspired by aircraft cockpits and lunar-module feet. The drawings and photo-montaged landscapes Kaplicky made, showed the relations of the house and nature, taking the weight from the house, detaching it from the earth with the aim to produce movable construction fitting different surroundings. Self sufficiency, necessary in the autonomous structure like this one, was provided by notional solar energy systems and even wind power, to sustain life-support bubbles in remote locations.

Figure 12. House for a helicopter pilot, 1979 (Source: Sketch by Authors)

Telematic House, Ugo la Pietra and Gianfranco Grasso, 1983

Telematic house is the experimental array of spaces that elaborates 'the implications of bringing the growing electronic memory together with the domestic space'. It was part of Milan Fair in 1982. Living room, bedroom, gym, kitchen and toilette have the orientation to electronic appliances as the main focus of each room. Each armchair has tv installed in its back side so the person sitting in the armchair behind has its own tv right in front of himself. Running treadmill in the gym has the tv on the top instead of its own screen, the mirror in the toilette is supported by three tv screens and there is one directly on the dining table. One's medium/connection to the outsidetakes place all over the house, all information are brought by electronic devices all around him. La Pietra's prediction directly questioned the relationship of change of people's behaviour within space.

Figure 13. Telematic House, 1983 (Source: Sketch by Authors)

Cellule No. X, Absalon, 1991
The main idea of Absalon's minimalistic sculptural series of so-called cellules is the human-scale size with no more room than one needs to live in. In the spectrum of 6 cellule-houses, their shapes are defined by the intended way of using the space. In consequence, first four houses have organic shapes, while the fifth one is cylindrical and No. 6 is almost a regular cube. Nevertheless, the total number of six differently designed units follows the number of cities (Paris, Zurich, New York, Tel Aviv, Frankfurt am Main and Tokyo) where they would be 'planted', so the artist can continue his nomadic lifestyle. Desk, table, tomb-like sleeping area and the prototype of combined toilet and shower together create each of these habitable enclosures. The measurements of the interiors are adapted precisely according to the measurements of Absalon's body. The range of floor surfaces starts with 4 square meters and goes maximum to 8 square meters, depending on the location of the cellule and artist's impression of that city.

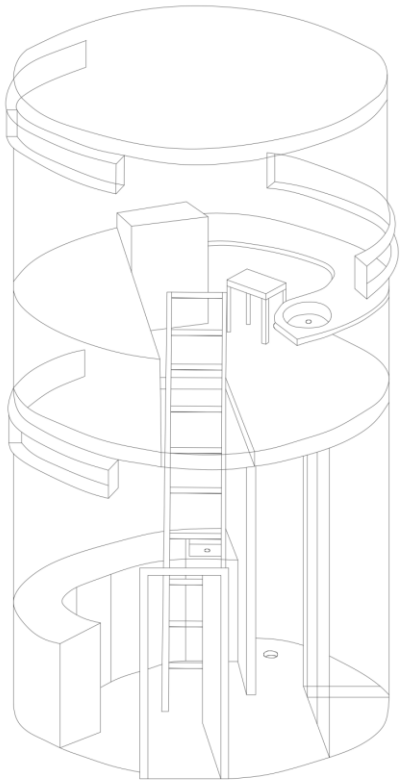

Figure 14. Cellule No. X, 1991 (Source: Sketch by Authors)

Placebo project, Dunne and Raby, 2001
Dunne and Raby demonstrate how electromagnetic forces influence certain aspects of our daily life. Design Noir: The Secret Life of Electronic Objects by Fiona Raby and Anthony Dunne (UK-USA) presents conceptual objects designed in the hope that it would evoke stories about 'the secret life of electronic objects' and instigate the users to think about the impact of technology in their lives. The influence of digital domain on one's experience of the surrounding environment, considering electronic objects such as computers, phones, tv etc. made up a basis for their investigation of their cultural and physical effects. They demonstrated a new way of thinking about objects and their relation with space and behaviour.
'*They are everywhere but they are invisible and we are not aware of them most of the time, although traces of their existence are all around us: people who suffer from an hyper-sensitivity to electromagnetic waves, telco equipments hidden in church spires, etc.*' Raby and Dunne were interviewed by Alex Wiltshire for ICON magazine. They question the conformity we are promised by manufacturers when they say we'll enjoy 'clean and perfect co-existence with gadgets'. They designed eight products, the peaces of furniture that were intentionally adopted by people to put them in their living spaces.
Basically, the extraordinary about this project is that conceptual design is placed beyond the gallery into everyday life. They made invisible electromagnetic fields visible, they made us see the radiation, they awoke us and showed the glimpses of the private life of electronic objects. As a result, anxieties and narratives that we compose around the presence of electronic objects in domestic spaces are relieved.

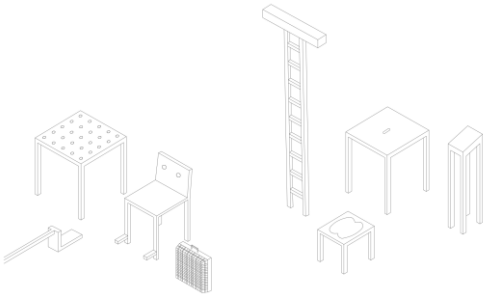

Figure 15. Placebo project, 2001 (Source: Sketch by Authors)

Domestic Transformer Apartment, Gary Cheng, 2009
Gary Chang's achievement is an impressive example of space transformation with 24 different living scenarions in only 32 square meters. He started to study his own apartment where he has been living since he was 14 years old. The cause of this experimentation was the fact that he had to live there with his three sisters and partents, until the two of them moved out. The optimization of the apartment can be reached by pulling walls and furniture around. For instance, glass shower and steam room share place. Living space with hammock, kitchen with sink, burners, dishwasher, refrigerator, abathroom with bathtub, toilet with a heated seat and remote-contol bidet, walk-in closet, dining area for five people, laundry room and remote con- trolled movie screen that doubles as curtains - all of these elements fit in 32 sqm fully automated apartment.

'*I don't mean this from an angle of eco-design, but somehow we touch on that by simple reduction. How big do you need a volume at different times?this is a very good example of flexibility in the sense of blurring the boundaryof public and private, or simply [architecture as] a device able to adapt for change*. ' Gary Chang

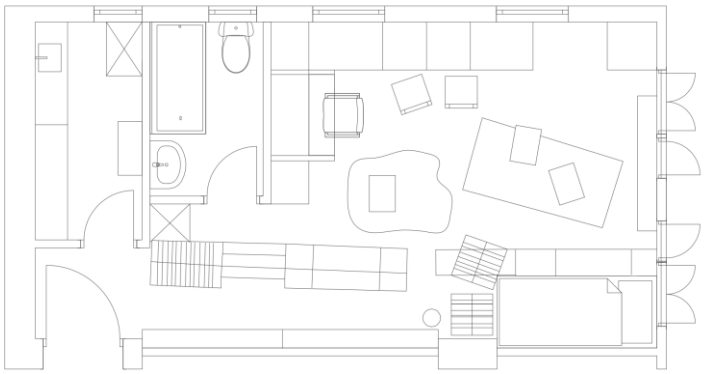

Figure 16. Domestic Transformer Apartment, 2009 (Source: Sketch by Authors)

Discussion
Compact living, maximized efficiency, and the dream of self-sufficiency emerged as dominant themes. Still, not all future visions were rooted in technological progress. Many alternative projects embraced emotional and psy- chological realms, offering surreal, idyllic, and nature-inspired forms. These homes represented a dreamier vision of domesticity—places where the boundaries between inside and outside, nature and technology, blurred into something more fluid and expressive. Today, our notion of home continues to evolve, appearing through the lenses of self-sufficiency, mini-living, nomadism, and efficiency. The future, it seems, is always just a little further down the road, waiting to reveal itself. Nevertheless, each of described projects owns specific concept, aim and strategy of design. Therefore, we concisely derived our perception of named notions for all listed projects (Table 1) presenting the main challenges of experimental housing projects of the future.

	About concept	Environment/Scenario/Setting	Aim	Strategy
Glass House, 1927	living without visual border	transparency, openness towards the environment	to highlight human's capacity (sight)	material: transparency of the wall
House of the Future, 1956	spaces flowing into each other with orientation on own garden in the middle	high density urban setting	to make personalized units	experimenting with the possibilities of building with plastic
Move net for Skyhouse, 1958	adaptable house	metabolism	to liberate the main floor plan	attaching and detaching volumes to the main volume
Box Type Apartments, 1962	prefabricated capsules	metabolism	to customize the space	prefabricating 4 different types
Plastic Ski Lodge, 1962	portable capsule	metabolism	to show that we do not need advanced technology solutions for simple space	depositing the unit to different location in nature
Pumpkin House, 1964	skeleton and organs house	metabolism	to create transformable space for couple	attaching and detaching volumes to the main volume
Furniture House, 1964	house not defined by the wall, but with the composition of the furniture	movable metabolism	to free the house from walls and create domesticity	experimentation with different furniture settings
Total Furnishing Unit, 1970	isolation off the grid	homogeneous living system	to create a seamless environment	including all personal necessities in hidden furniture
Micro Environments, 1971	elements inside the house on the move	undetermined	to liberate the home from electrical appliances	framing and isolating the furniture from the free space
2010 Living in the Future, 1972	extinction of the furniture when floor becomes bed	'In 2010 there are so many people that every inch of the ground must be used correctly'	home as depository of memories	it is soft where you sit or sleep, hard where you need a table or the desk'
Nakagin Capsule Tower, 1972	first extremely small units for actual use	metabolism	to experiment with first capsule living	detaching and replacing units
House for Helicopter Pilot, 1979	machinery show-off	nature	self-sufficiency	using strength and precision of machinery
Telematic House, 1983	growing electronic memory reflected in domestic space	technological connection with the world	to research the relation between technology and behavior	over-populating house with technology (tv screens)
Cellule No. X, 1991	4-8 m^2 personal unit	planted personal units all over the world	to provide personal space for different cities	shaping space by future way of using
Placebo project, 2001	reading electromagnetic waves	in the presence of invisible electromagnetic waves	to dive in 'the secret life' of an object	making electromagnetic waves 'visible'
Domestic Transformer, 2009	space transformation	constant re-adaptations	to adapt space for different family configuration	setting furniture with multiple meaning

Table 1. The overview of concepts, settings, aims and strategies in selected projects for houses of the future

This overview helped us to understand some main common initiators for design and conceptual determination in housing projects for the future. The wider specter of common initiations includes:

- the show-off power of material;
- possibility of interior (expanding);
- evoking nature within the house;
- privacy;
- mobility;
- technological revolution;
- 'framing' appliances;

- minimal size;
- customization;
- various scenarios / settings of domestic environment;
- nomadism;
- ‘view to heaven’;
- evoking human feelings,

While in the chart (Figure 17) we presented only the terms that were remarked and repeated at least in two out of 16 analysed projects.

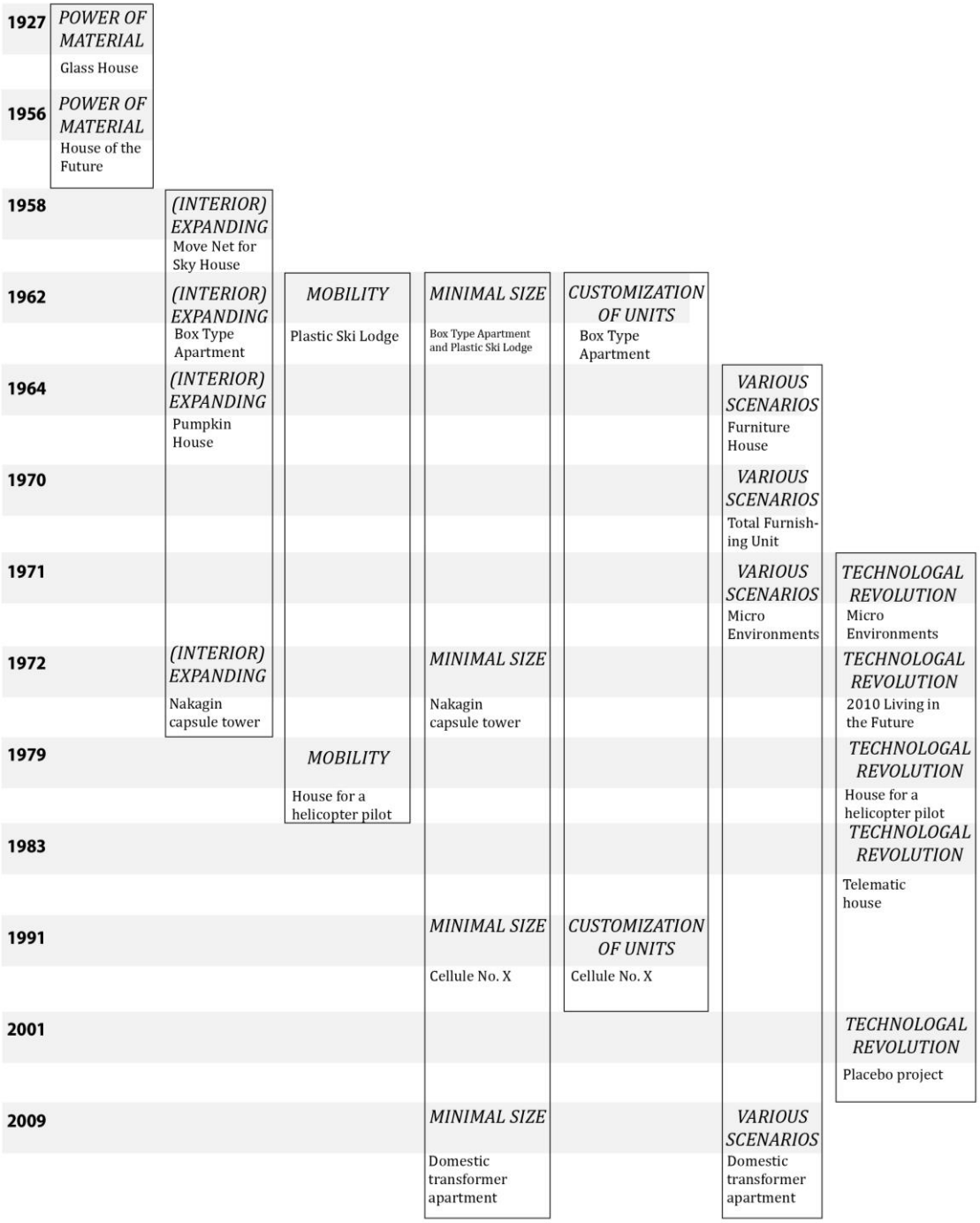

Figure 17. Common design initiators

Conclusion

This exploration of the history of 'houses of the future' and all the underlying philosophies has revealed a constant interplay between technological innovation and the evolution of domestic life. From the glass transparency of Eisenstein's unbuilt skyscraper to Gary Chang's transformable apartment, each project exemplifies how architecture responds to shifting societal needs, technological advancements, and our ever-changing relationship with space. These houses reflect not just technical progress, but also the human imagination's capacity to predict, question, and shape the future. At the heart of these visionary designs lies a desire to address emerging challenges, whether through maximizing space, enhancing flexibility, or integrating technology in ways that reimagine domestic comfort.

The 20t^{h} century's revolutions in media, mobility, and technology fueled up these radical architectural experiments, which often blended utopian aspirations with practical responses to the constraints of modern life. Projects like Nakagin Capsule Tower and Joe Colombo's Total Furnishing Unit exemplify how modular, compact, and automated spaces became blueprints for future living, offering adaptability and self-sufficiency in an increasingly crowded world. As we reflect on these historical visions, we see a path toward homes that are not just spaces for shelter, but systems for living—flexible, responsive, and attuned to the unique needs of individuals.

The intersection of technological advances and evolving social dynamics has made it clear that the 'house of the future' is a constantly moving target, shaped by the complexities of its time. Ultimately, this study demonstrates that architecture continues to be a powerful tool for anticipating, critiquing, and shaping the environments of tomorrow, constantly balancing the tension between progress and preservation, efficiency and comfort.

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