



## Reading The Future of Healthcare Facilities Through Science Fiction Films in The Context of Scientific/Technological Advancements

*Sağlık Yapıları Mimarisini Bilimsel ve Teknolojik Gelişmeler Bağlamında Bilim Kurgu Filmleri Üzerinden Okumak*

### ABSTRACT

The future has always been a subject of curiosity for humankind. Science does not work to predict the future, but it does enable consistent predictions of future possibilities. Scientific and technological progress is advancing rapidly every day, leading to changes in various aspects of our lives through the discovery of new knowledge and technologies. The future is being shaped by the scientific and technological developments of today. The field of science fiction and science fiction movies directly targets scientific and technological progress and explores the possible changes that may result from these developments. When looking at science fiction films in general, it can be seen that in addition to many topics such as artificial intelligence, augmented/virtual reality, and space technologies, possible advances in areas such as health, medicine, and genetics are also explored. Discoveries in health, medicine, genetics, etc., not only impact human health and longevity by increasing opportunities for early diagnosis, prevention of diseases before they even occur, and early intervention, but also influence the spatial design and structure of healthcare facilities. In this context, health care facilities and advances in health prove to be important areas addressed in science fiction films. Science fiction films provide important stimuli and clues to both anticipated technological and scientific advances and their spatial implications, thus offering glimpses of the future. In this regard, the main objective of this study is to create awareness of the possibilities that users, architects, and designers in healthcare facilities can expect in the future and to emphasize the importance of preparing designers and architects for the future. Consequently, it is recommended that studies be conducted to prepare aspiring architects and designers for the future and to guide individuals in this regard.

**Keywords:** Architecture, Healthcare Facilities, Healthcare Facilities Architecture, Science Fiction, Science Fiction Movies

### ÖZET

Gelecek insanoğlu için hep merak konusu olmuştur. Bilim ise geleceği tahmin etmek üzerine çalışmasa da gelecek olasılıklarına ilişkin tutarlı tahminleri mümkün kılmaktadır. Bilimsel ve teknolojik gelişmeler her geçen gün hız kazanarak ilerlemekte, yeni bilginin ve teknolojilerin keşfi ile hayatımızın birçok alanında değişiklikler meydana gelmektedir. Gelecek ise bugünün bilimsel ve teknolojik gelişmeleri ile birlikte şekillenmektedir. Bilim kurgu alanı ve filmleri ise doğrudan bilimsel ve teknolojik gelişmeleri hedef alan ve bu gelişmeler doğrultusunda ortaya çıkabilecek değişiklikleri işleyen önemli bir alandır. Bilim kurgu filmleri üzerine genel bir inceleme yapıldığında yapay zeka, artırılmış/sanal gerçeklik, uzay teknolojileri gibi birçok konunun yanında sağlık, tıp, genetik vb. alanlarda olası gelişmelerin irdelendiği gözlemlenmektedir. Sağlık, tıp, genetik vb alanlarda yaşanan buluşlar hem çeşitli hastalıkların önceden teşhis edilmesi, hastalıkların daha hiç ortaya çıkmadan engellenmesi, vakalara erken dönemde müdahale edilmesi gibi olasılıkların artması ile insan sağlığı ve ömrünü etkilerken hem de sağlık yapılarının mekânsal kurgusunu, yapısını da etkilemektedir. Bu bağlamda sağlık yapıları ve sağlık alanındaki gelişmeler bilim kurgu filmlerinde konu olarak ele alınan önemli bir alan olarak karşımıza çıkmaktadır. Bilim kurgu filmleri hem gelecekte beklenen teknolojik, bilimsel gelişmeler ve etkileri hem de neden olabilecek mekânsal değişiklikler açısından önemli öneriler sunmakta ve geleceğe dair ipuçları vermektedir. Bu bağlamda bu çalışmanın en temel amacı sağlık yapılarında gelecekte kullanıcıları, mimarları, tasarımcıları bekleyen olasılıklar konusunda farkındalık yaratmak ve tasarımcıların, mimarların geleceğe hazırlanmasının önemine dikkat çekmektir. Bu bağlamda mimar ve tasarımcı adaylarını geleceğe hazırlamaya yönelik çalışmaların yürütülmesi, kişilerin yönlendirilmesi önerilmektedir.

**Anahtar Kelimeler:** Mimarlık, Sağlık Yapıları, Sağlık Yapıları Mimarisi, Bilim Kurgu, Bilim Kurgu Filmleri

### INTRODUCTION

Throughout human history, science and technology have been central to the development and progress of societies. Scientific discoveries and technological advances have helped people understand nature, solve problems, and predict the future. However, science and technology have not been limited to these aspects, but have also shaped the future and the concept of space. First and foremost, scientific discoveries have deepened people's understanding of the world and led to conceptual changes. Numerous discoveries have influenced the way people think and laid the foundation for future scientific research and other explorations.

Technology has also played an important role in shaping the future and space. Technological progress, which began with the Industrial Revolution, has fundamentally changed the way people live and use space. The use of machines

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has accelerated production processes, improved transportation, and created new spaces. For example, railroads and automobiles have enabled people to travel great distances more quickly and easily, leading to the growth of cities and the transformation of rural areas.

The effects of scientific and technological progress are even more evident in modern times. Developments in areas such as computers, the Internet, artificial intelligence, and biotechnology have profoundly affected our lives and will continue to change the world in the future. Through the Internet, people around the world can easily communicate with each other, access information, and work remotely. Artificial intelligence and robotics are transforming industrial production and the service sector, creating new employment opportunities and redefining the use of space. Biotechnology is driving revolutionary advances in healthcare and transforming the future in areas such as treating disease and extending the human lifespan.

Scientific and technological progress is expected to accelerate and deepen in the future. Discoveries and inventions in areas such as new materials, energy sources, space exploration, and combating climate change will shape future spaces and ways of life. For example, as space exploration increases, the idea of colonizing space and exploiting resources in space may become more realistic, changing people's perceptions of space and settlement patterns. The development of renewable energy sources and the introduction of sustainability principles may lead to space becoming more environmentally friendly and energy efficient in the future. Scientific and technological progress plays an important role in shaping the future of humanity and space.

While scientific progress is not designed to predict the future, it does provide us with theories, laws, and inventions that offer consistent possibilities for the future. Curiosity about the future, the problems we expect to solve, the universe, and the unknown direct humanity toward scientific research based on reality and experimentation. If people follow scientific developments and inventions properly, they can make accurate predictions about the future with high probability. For example, about a century before mankind took its first step on the moon, Jules Verne (Verne, 2020) made remarkably accurate predictions about the " journey to the moon, the specifications and dimensions of the spacecraft, the number of people who would go, the launch site on Earth, and the time it would take to reach the moon in his book "From the Earth to the Moon."

Jules Verne, although not a scientist, consistently and accurately predicted the future for about 100 years because he constantly pursued scientists and inundated them with questions about the future (Kaku, 2011).

Based on his research, scientific advances, and books (Kaku, 2011, 2019a, 2019b) Michio Kaku describes a day in the life of a person in the early 2100s. This narrative depicts how inventions such as perception and telepathy-based home control, robots, contact lenses connected to the online network (Internet), magnetic transport vehicles, lifelike holograms, augmented virtual reality, quantum computers, smart wallpaper, vertically adjustable elements that turn into screens, and the life experiences of the first colony on Mars and space elevators shape everyday life in great detail. It would not be inaccurate to say that the most remarkable inventions among these descriptions are in the field of healthcare. All elements in wet rooms (toilet, bath, sink, mirror, etc.) are medical laboratory components that function silently with hundreds of hidden DNA and protein receptors on their surfaces. Molecules from breath to body fluids are analyzed, and clues to disease are examined. MRI machines are now the size of a modern cell phone, so appropriate scans can be performed at home. Another development is the elimination of the need to find organ donors for organ transplants. Organs can now be produced and grown in the laboratory. Aging is slowed down and the human lifespan is extended (Kaku, 2011).

As humanity continues to strive for its existence on Earth, Mars, or some other corner of the universe, advances in health care are essential. However, it may be that the first structures built on Mars for the first colonies will not be fully equipped hospitals.

The hypothesis of this study is based on the belief that, given advances in science and technology, inspiration from the science fiction genre could provide valuable insight into the design of future healthcare facilities. Science fiction is an important genre that revolves around scientific and technological developments and creates narratives based on these advances. By exploring the concept of design and creating fictional scenarios, overlaps with the field of architecture and encompasses the design of spaces planned based on various developments.

In this context, the use of science fiction can help develop an initial understanding of the designs and facilities of future healthcare structures. It allows us to explore imaginative scenarios and envision the possible environments and events that could arise from these scientific and technological advances.

The Oxford English Dictionary defines science fiction as "imagined scientific discoveries of the future, and often deals with space travel and life on other planets" (The Oxford English Dictionary, 2023). Sterling, on the other hand, defines it as "a form of fiction that deals principally with the impact of actual or imagined science upon

society or individuals" (Sterling, 2023). Roberts highlights in his book that science fiction, while easy to recognize, becomes more complex upon closer examination (Roberts, 2000). When examining the various definitions of science fiction, it can be interpreted as the creation of a narrative that brings together the realms of reality and fantasy through the lens of science and technology. This narrative can find its place in various media such as literature, film, and comics.

In science fiction films, one can directly witness spatial designs and get a first idea of the spaces that humanity will find based on various developments. Therefore, it would be helpful to look at science fiction movies from a spatial perspective to develop ideas for future designs.

## **READING THE FUTURE OF HEALTHCARE FACILITIES THROUGH SCIENCE FICTION FILMS IN THE CONTEXT OF SCIENTIFIC/TECHNOLOGICAL ADVANCEMENTS**

### **Expected Developments in the Field of Health**

"I don't really think our bodies are going to have any secrets left within this century. And so, anything that we can manage to think about will probably have a reality (David Baltimore) (Kaku, 2011)."

The pursuit of health and immortality by humanity is not new. In the region known as the island of Kos, located south of Miletus, Apollo's son Asclepius is the god of healing. The examinations are performed in the form of rituals. After the patient is purified in a nearby spring, he enters the temple and makes an offering to Asclepius. The sleeping patients in front of the empty altars, on which the offerings collected by the priests during the night are placed, believe that Asclepius has accepted the offering. The patients then go to a dark chamber where they spend the night. They interpret the dreams and visions they see in the dark chamber as a visit from Asclepius, which they share with the priests. Based on these dreams, the priests show or apply treatment methods to the patients ("Bir Zamanlar Tıp," 2000).

From ancient times to the present day, discoveries, technologies, and the accelerating pace of technological progress have led to a growing body of knowledge about the human body that contributes directly to the development of the health care system. In particular, innovations and discoveries in areas such as molecular medicine and molecular genetics have led to many anticipated advances in the field of medicine. Examples include a person suffering from Parkinson's disease being able to play golf after a transplant of pig brain tissue, enabling a mental exchange between humans and animals (Hauser, 2007); the resurrection of extinct species using genetic maps extracted from fossils, as depicted in the movie Jurassic Park (Sawkins, 2007); the integration of various robotic technologies, prosthetic limbs made of silicone and steel, French fries implanted in the human body leading to the complete overcoming of visual and hearing impairments and the elimination of physical disabilities, with direct online network connections enabled by brain implants (Brooks, 2007); the accessibility of our genetic maps, including information on genetic predispositions, enabling the study of genetic propensities in all types of diseases and medical visits (Barondes, 2007); ending the transmission of disease-causing genes to future generations and preventing genetic diseases through gene therapy, the creation of designed children, the development of stem cell technology for the production and growth of human organs and limbs, and the reversal of aging processes (Kaku, 2011). These advances suggest that many breakthrough inventions could become a reality.

### **The Possible Spatial Impact Of Expected Developments In The Health Sector**

From the past to the present, each new discovery in the field of health has had a direct impact on the spatial design of healthcare facilities. The methods of curing diseases influenced by religious beliefs, magic, and witchcraft gradually gave way to more conscious and rational systems with the discovery of knowledge (S. Aslan & Erdem, 2017). The Renaissance era can be considered as a turning point in medicine and healthcare institutions with the increase of scientific research (Kavuncubaşı & Yıldırım, 2012; Nasuhioğlu, 1974). In ancient times, the healing process began to take place in temples because the gods were believed to have healing and immortal powers, and was eventually performed in dedicated spaces. Nowadays, healthcare campuses and approaches such as healthcare structures in nature are becoming more common.

A century ago, medicine successfully used critical inquiry and evidence-based research as tools to determine its position, thereby increasing its visibility and prestige. It is evident that the critical and continuous review and reassessment of the history of medicine has led to this outcome. Taking a historical perspective can help make sense of recent developments and encourage participation in paradigmatic discourse. The following six rubrics address the relationship between the built environment, human health, and sustainability. Each rubric addresses a model that is seen as therapeutic and healing, preventing the patient from feeling oppressed. These patterns in healthcare environments were considered therapeutic values in ancient times but disappeared in the Middle Ages. They were rediscovered by Florence Nightingale and her contemporaries in the mid-nineteenth century, only to be

discarded again in the mid-twentieth century and rediscovered more recently. It was then discarded in the mid-nineteenth century and rediscovered more recently. These six points can be summarized as natural ventilation, natural light and views, water and sanitation, landscaping, building form and spatial design, preservation of historic resources, use of local building materials, and self-sufficiency (Stephen Verderber, 2010). Particularly for healthcare facilities designed in the 2000s, beyond the functional analysis of the structure, the positive spatial experience of patients, their families, staff, physicians, and other healthcare professionals have become more important as a result of the aforementioned issues. Currently, the integration of future healthcare structures into an ecosystem as hospital parks is being discussed (Bulakh et al., 2021).

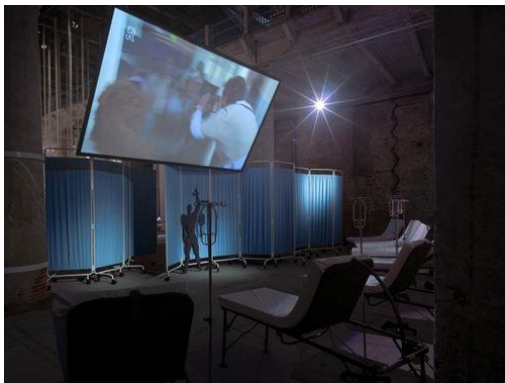


**Figure 1:** The hospital building for Hillerød near Copenhagen was designed in 2013 in collaboration with BIG (Bjarke Ingels Group), WHR Architects and Arup.

**Reference:** (BIG, n.d.)

One of the most important characteristics expected of hospitals of the future is their ability to adapt to new problems and developments that occur every day. It is also among the possibilities that in the coming years the importance of hospitals designed to be integrated with nature and people will increase over artificial spaces equipped with Technologies (Grey, 2015).

Based on research and curiosity about the future of healthcare facilities, OMA/Reinier De Graaf was invited to the 17th International Architecture Exhibition - Venice Biennale with the theme "Hospitals of the Future" The installation specifically addresses the current COVID-19 pandemic and possible developments in healthcare, evaluating them in a common context. The main idea behind the design is to avoid going to the hospital and instead focus on remote interactions and individualized treatments (Stouhi, 2021). In an interview with OMA/Reinier De Graaf, they emphasize that in the future hospitals will be present everywhere in the city (Ravenscroft, 2021).



**Figure 2:** The installation entitled "Hospitals of the Future," designed by OMA/Reinier De Graaf for the 17th Venice Biennale, deals with the future of hospitals.

**Reference:** (Vecchi, 2021).

One of the biggest projects being discussed lately is the possibility of establishing life on Mars. As mentioned in the introduction, the answer to the question of whether life can be established on Mars will depend on the success of the first colonies. However, the first structures to address the health problems of these colonies cannot be fully equipped with hospitals. To restore the health of astronauts who might fall ill during the Mars missions, the UAE Space Agency, in collaboration with the Ministry of Health, has designed a space clinic. The main goal of this project is to improve telemedicine, which is already used in the UAE, between Mars and Earth. Using nanotechnology, treatments can be delivered remotely from Earth (Webster, 2018).



**Figure 3:** From left to right: Space Hospital Project (Zain, 2018), Mars Health Capsules (Bulakh et al., 2021)<sup>2</sup>.

**Reference:** From left to right: (Zain, 2018), (Bulakh et al., 2021)<sup>3</sup>.

Apart from the spatial changes and transformations mentioned, the innovations discussed in the previous section also lead to other formations. The research carried out gives us indications<sup>4</sup> of the developments that the spaces<sup>5</sup> commonly used in healthcare facilities today will undergo.

Your visit to the doctor's office will change drastically. While talking to the doctor on the wall screen, you will probably interact with a software program. Your bathroom will be equipped with more sensors than a modern hospital, silently detecting cancer cells years before a tumor forms (Kaku, 2011).

**Care stations:** Nursing stations can include regular, intensive, and specialized nursing stations. Advances in artificial intelligence, molecular medicine, genetics, and stem cell research will lead to a decrease in the prevalence of disease, early detection of many diseases, and the ability to diagnose and treat many diseases from the comfort of one's home. Therefore, in the near future, the number of regular nursing stations will likely decrease and eventually disappear. However, the complete elimination of ICUs is less likely because it is very likely that people in critical condition will require the use of advanced technologies available only in hospitals and the assistance of medical professionals. Although the number of intensive care units may decline, their complete disappearance is not very likely in the foreseeable future.

**Treatment units:** Treatment units are categorized by medical departments such as gynecology and obstetrics, internal medicine, general surgery, etc., and typically include spaces such as clinics, laboratories, operating rooms, surgical procedure areas, and imaging rooms. With the integration of artificial intelligence and nanotechnology, many of the furnishings found in the wet rooms of our homes will be transformed into laboratory equipment. In addition, there is the possibility that imaging devices will become accessible even in our homes or even in our mobile devices. As a result, many diagnostic procedures will be performed at home. Laboratory facilities and imaging rooms used for the diagnosis will become obsolete. Test results for the diagnosis will reach our physicians directly, and our physicians will establish online connections with us. Virtual reality technologies will enable remote examinations. As a result, the number of clinics will decrease and even disappear. Operating rooms and surgical procedure areas will also change as robotic technologies become more widespread and require less human intervention in surgical procedures, leading to the downsizing and reconfiguration of these areas.

There are several approaches that suggest an increase in psychiatric outpatient clinics (Barondes, 2007).

**Administrative Departments:** With advances in artificial intelligence, robotics, and hologram technologies, administrative units will shrink in the near future and eventually cease to exist in the distant future.

**Shared spaces:** in the distant future, shared spaces will also shrink, for example, as the number of users in hospitals declines. However, there are studies on the benefits of hospitals as part of an ecosystem integrated with nature, and shared spaces integrated with nature are expected to increase in the near future.

**Waiting rooms:** With the decline of face-to-face consultations and the digitization of patient information, records, and even patient DNA mapping, the concept of waiting and waiting areas will disappear.

<sup>2</sup> The image is from the study titled "Is The Hospital-Park Future Of The Sustainable Hospital Architecture?" The authors of the study mentioned that they obtained this image from the website <https://dubaiowf.com/mars-science-city-launched/>.

<sup>3</sup> The image is from the study titled "Is The Hospital-Park Future Of The Sustainable Hospital Architecture?" The authors of the study mentioned that they obtained this image from the website <https://dubaiowf.com/mars-science-city-launched/>.

<sup>4</sup> The ideas about the evolution of healthcare facilities have been derived from sources written by Michio Kaku (Kaku, 2011, 2019b, 2019a) and Hawking (Hawking, 2019).

<sup>5</sup> The determination of spatial arrangement in healthcare facilities is based on various research studies found in different sources (Alalouch et al., 2016; Neufert, 1977; Stephen Verderber, 2010), as well as observations made in hospitals.

New spaces: in addition to the disappearance of spaces, new spaces will also emerge. These include facilities such as AI diagnostic outpatient clinics for people who do not have access to or cannot afford certain technologies, and procedure rooms equipped with robotic technologies. Designing spaces for organ production using new technologies such as stem cells and nanotechnology is also a possibility.

### Reading The Future of Healthcare Facilities Through Science Fiction Films

As mentioned in the introduction, when examining the various definitions, science fiction can be interpreted as the creation of fiction in which the real and imaginary worlds come together under the light of science and technology. This fiction can find its place in various forms such as literature, cinema, and comics.

In science fiction films that deal with changes in the social structure and human experience in the future, attention is drawn to the accompanying spaces that shape and accompany human life. The impact of scientific and technological advances on the field of healthcare and their spatial reflections have also been the subject of science fiction films.

The film "Transcendence," released in 2014, discusses the possibility of transferring the human brain to artificial intelligence and its implications. The film revolves around a doctor who wonders if a conscious artificial intelligence can be created and decides to transfer his own brain to a quantum computer, resulting in his consciousness persisting even after his body dies. The film depicts the pursuit of immortality. In addition, the film addresses the ethical and philosophical issues associated with advanced developments in health technology and consciousness transfer (Pfister, 2014). The concept of "consciousness spaces," which refers to spaces equipped with artificial intelligence and computer technologies where consciousness exists without being bound to a body, is explored. In addition, hidden underground laboratories are designed for conducting special experiments and developing and using the transferred human mind in computers. These spaces are minimalist in design and equipped with high technology.



**Figure 4:** A space equipped with quantum computers, reflecting the interaction between artificial intelligence and consciousness, spaces of consciousness.

**Reference:** (Pfister, 2014).



**Figure 5:** Underground laboratories in Transcendence

**Reference:** (Pfister, 2014).

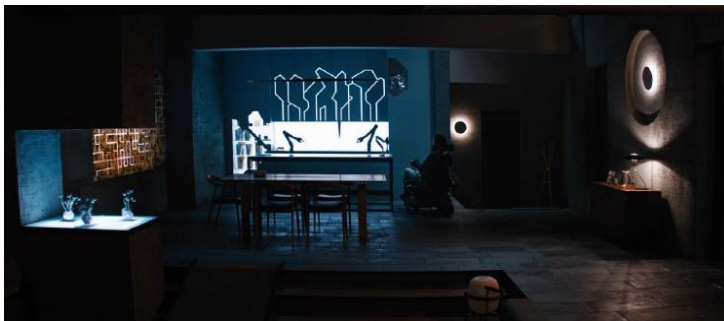
In the movie Elysium, released in 2013, Earth is depicted as struggling with diseases and overpopulation, while a privileged few create a living space for themselves in close proximity to Earth, in space. While Earth struggles with numerous diseases, the space habitat is seen to have a capsule design where all types of diseases can be detected and treated. The film portrays a future where health problems can be detected and solved with a single capsule, suggesting sophisticated health care (Blomkamp, 2013).



**Figure 6:** Health capsule in the movie Elysium.

**Reference:** (Blomkamp, 2013).

In the movie Upgrade, released in 2018, a single implanted chip is able to fix all physical impairments, repair the nervous system, and take control (Whanell, 2018). The problem of a paralyzed person being able to continue their life at home is reflected in the narrative of interior design that includes integrated designs with technology. The integration of robotic technologies into furnishings and space has been developed. The home now serves as a small health unit in addition to its primary function.



**Figure 7:** The effect of the developments in the field of health on the housing space.

**Reference:** (Whanell, 2018).

The devices that eliminate paralysis and are implanted in people with paralysis are installed in rooms that are fully equipped with technology, while the room itself is designed with multi-layered geometry. Simplicity and minimalism are emphasized in the design of these rooms.



**Figure 8:** Intervention spaces in health structures.

**Reference:** (Whanell, 2018).

The examples of science fiction movies can be extended even further. Considering that Aldous Huxley aptly predicted future developments such as test-tube babies and birth control in his 1932 science fiction novel Brave New World, it is reasonable to assume that the advances depicted in these films may become a reality in the future. In this context, it will be necessary to be prepared for spatial changes.

## CONCLUSION AND RECOMMENDATIONS

This research was conducted with the aim of determining the potential impact of inventions on spatial structures, spatial narratives, and the existence of healthcare facilities in the near and distant future. In this context, science fiction films were used as tools. The results suggest the possibility that in the distant future, healthcare facilities will disappear over time, our homes will function as healthcare spaces and small capsules in nature will perform all

diagnostic and treatment functions. In particular, many tasks currently performed by humans will be performed autonomously in conjunction with artificial intelligence and robotic technologies. This means that various healthcare facilities and other ancillary services will shrink and eventually disappear altogether in the near future. Factors such as artificial intelligence, robotics, genetic and molecular medicine, the discovery of stem cells, early detection of diseases, treatments in their initial stages or their elimination, and the availability of appropriate equipment to perform diagnostic tests at home will contribute to the shrinking of these facilities in the near future and their disappearance in the distant future. In addition, it is expected that new spaces will emerge for stem cell research, genetic studies, and the production of organs and body parts.

Advances in healthcare will transform not only healthcare facilities but also our homes and certain places in cities. As diagnostic methods are integrated into our homes, the elements, materials, shapes, and sizes of interior design will likely change. In addition, a special health room could be established in our homes for diagnostic and treatment purposes. Instead of visiting a doctor, we could use augmented reality or hologram technologies to communicate with them at home, leading to the design of new spaces where we can interact with our doctors. Medical capsules, themed in many science fiction films and designed for life on Mars, could replace healthcare facilities in the distant future and persist as capsules in parks, children's playgrounds, and other indoor or outdoor public spaces. Alternatively, units consisting of capsules could be deployed in a variety of specific locations. For example, if a child breaks his or her arm on a playground, a parent or teenager is hit by a car on the street, or a human faints in a shopping mall, they can be taken to the nearest capsule for diagnosis and treatment. It may be possible to receive regular treatment for diagnosed conditions at home. Healthcare will permeate every aspect of our lives, entering every open and closed space. It is likely that health capsules/rooms will become mandatory units in every designed space.

Architects and designers need to be prepared for possible future developments. In this regard, it is recommended that studies be conducted to prepare future architects and designers and to provide guidance to individuals.

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