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Examination of Contemporary Additions Made with Adaptive Reuse of Historic Building Heritage

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ABSTRACT
Historical buildings, which are at the center of social memory, are important components of the built environment and urban life. Due to the change in living conditions over time, historical buildings lose their function and integrity is deteriorated, and they face the danger of extinction by taking structural damage. Since these structures bear the traces of the period in which they were built and form the identity of the city, they should be protected and their continuity should be ensured. Historical buildings can meet the demands of users by making contemporary additions in the context of adaptive reuse, as well as by preserving their current state and function. Within the scope of this study, the issue of making a contemporary addition to historical buildings, which is one of the adaptive reuse techniques, has been examined. The reasons for the contemporary additions applied to the historical buildings with adaptive reuse were examined and presented in sub-titles. In the examined buildings, the transformation of historical buildings that were destroyed due to factors such as the need for new space, change in function, wear due to wars and natural disasters were analyzed and the original and contemporary additional construction systems were compared.
Keywords: Adaptive reuse, Building material, Contemporary addition, Facade, Historical building, Structural system.

1. INTRODUCTION

Historical buildings form the focus of urban and social life, as they are important components of the built environment and urban memory (Yazdani Mehr, 2019; Tam et al., 2016). These buildings, which carry traces of a society's past and express the diversity of societies throughout history, are exposed to war, fire and natural disasters in the process. Historical buildings, which have lost their function and become unusable with the change in social facts and living standards over time, are damaged due to various reasons, deteriorating their integrity and facing the danger of extinction (Langston et al., 2013; Wang and Nan, 2007). Many historical buildings, which were built to meet the needs of the period, are unable to meet the needs of today's users in their current state. Since these structures carry the traces of the past, and therefore they are social, cultural and structural documents of the period they were built, their continuity should be ensured and protected (Aigwi et al., 2019; Chen et al., 2018). Sustainability and protection can be achieved by adapting these structures to today's living conditions (Mısırlısoy and Günçe, 2016). The use of innovative construction systems and materials is required (Takva et al., 2022). Adaptive reuse provides a new product to the building stock by replacing old functions with new functions (Ali et al., 2018). The prevention of causes such as erasing the past of societies and the disappearance of social memory and ensuring the adaptation process is possible by providing a new function that can meet

the demands of the users or by contemporary additions where the existing functions can meet the needs today (Bullen and Love, 2011).

Contemporary addition practices should be carried out meticulously in the protection of historical buildings and built environments. Conservation studies should be conducted according to today's space needs, social and environmental characteristics (Hong and Chen, 2017; Hein and Houck, 2008). At this point, one of the conservation methods is to make a contemporary addition. Contemporary additions to historical buildings should be designed in a way that contributes to the potential of the region, preserves the original character of the historical building and not destroy the original building texture (Pieczka and Wowrzeczka, 2021; Tam and Hao, 2019). New additions should be made and detailed with a contemporary interpretation of the historic building in mind so that it can be distinguished from the original building (Foster, 2020). Conservation practice, which will be implemented by making a contemporary addition, allow the use of the building and the transfer of the historical structure to future generations (Fedorczak-Cisak et al., 2020). In these types of applications, although the design rules and methodologies applicable to architectural planning are valid, the designer cannot integrate the application principles into any new building design process (Yung and Chan, 2012). Integrity can be achieved with the application of modular applications (Takva et al., 2022). Interventions to historical buildings should be made considering the original data of the building and the period in which it was built (Rodrigues and Freire, 2017). While these interventions may be in a formal, sensitive and dynamic harmony that emphasizes contrast, they may also exhibit an attitude that rejects harmony. The designer needs to act in accordance with international agreements, declarations and regulations in the field of architectural conservation in all interventions.

It has been understood that the protection and continuity of the built environments should be ensured by raising awareness, especially in the 20th century for the protection and adaptive reuse of historical buildings (Abastante et al., 2020; Conejos et al., 2016). For this reason, various studies and meetings were held on an international scale. Because of these organizations, many statutes and declarations containing the principles of implementation have been created for the participating countries to protect historical structures. The Carta Del Restauro Declaration emerged as part of a conference held in Athens, Greece, in 1931. It is important because it is the first international conference to emphasize the need to preserve historical buildings (Stubbs and Makaš, 2011). In the declaration, the articles still valid today about the practices to be made for protecting historical buildings and built environments are listed. In Article 6, it is stated that the environment of the historical building should be respected and the historical building, and that the monument should not be left alone by cleaning the surroundings of the monument, or that unqualified, mass, color, etc. It was stated that disturbed buildings should not be allowed. Article 7 states that if a historic building needs to be added to it for consolidation, integration, or reuse, the new elements should be used as little as possible, and should be simple and reflect the structural order. The additions to be made in a similar style were required to continue the existing lines of the building and to be free of decoration. In Article 8, it is stated that the additions to be made must be precise and clear, and must be made using a material different from the original building material. The statement of providing the expression of the quality of the contemporary building addition by specifying it as a frame, stamp, or an inscription is also included in the declaration (Starn, 2002).

Within the scope of the Venice Charter published in 1964, various conceptual explanations about the preservation and restoration of historical buildings are included (Scazzosi, 2018). It has been stated that historical buildings are both artistic and historical documents. It was stated that for the contemporary additions to be made, they should be documented in a way that can be distinguished from the original building. In Article 6, it is emphasized that no new contemporary additions that will change the mass and color relations of the historical building are allowed, and that any addition to the

historical buildings should be differentiated from the original building in Article 9. In addition to these, the issues of compatibility of the contemporary additions to the interesting parts of the original building, its traditional composition, balance and connection with the environment without harming are mentioned. In Article 12, it is emphasized that when completing the missing parts, it is necessary to pay attention to the fact that the material used is in harmony with the building (Lidelöw et al., 2019; Petzet, 2004). Another declaration is the Nairobi Declaration. In the declaration accepted at the meeting held in Nairobi in 1976, it was stated that historical environments are important values that reflect the traces of the past to the present, and that care should be taken to ensure that they are protected and added to the building stock with appropriate functions. In Article 4, it is stated that historical buildings and environments should be protected against all kinds of danger, and attention is drawn to avoiding unnecessary, wrong, or insensitive additions. The condition that the connection between the additions and the original building is meaningfully was accepted in the declaration. The Icomos Traditional Architectural Heritage Charter was adopted at a meeting held in Mexico in October 1999. Within the scope of the regulation, principles are listed on the protection and maintenance of historical buildings and additions to be made (Gregory, 2008). In Article 2, it is discusses that contemporary interventions to historical buildings and settlements should respect cultural values and traditional characters, and in Article 4, the use of materials compatible with the general expression of the whole and not contradictory in terms of appearance, texture and form are discussed in Article 4 (Ahmad, 2006). The Paris Declaration was made on the protection of cultural heritage and its values at the conference held with the participation of 109 countries at the UNESCO headquarters in 2011. Regarding the additions to the historical buildings within the scope of the declaration, the features of preserving the original construction of the building, adapting the reuse to the historical structure and meeting the demands of the users at the modern comfort level were emphasized (Meskell, 2012).

In this study, the reasons for the contemporary additions applied to historical buildings with adaptive reuse were examined and presented in sub-titles. Then, contemporary additions to historical buildings were classified in detail under the headings of completion and mass additions through building samples from Turkey and the world. Completion are evaluated on the basis of building elements as roof and facade completion. Mass additions were examined by adding floors, completing mass and categorizing additional buildings. The original historical construction system of the examined sample buildings and the construction systems of contemporary additions were compared. Inferences were made about building materials and construction systems.

2. REASONS FOR CONTEMPORARY ADDITIONS IN HISTORIC BUILDINGS

It is necessary to make some interventions to make the historical buildings meet the needs of today's users. Interventions are aimed at consolidating historical buildings, using them actively and transferring them to future generations in an appropriate way. Some of the historical buildings that need to be preserved in accordance with today's conditions, which have undergone restoration, contain various interventions from different periods. The necessity of making various interventions to protect the historical buildings and ensure their continuity is clearly stated in the declarations and regulations. In this context, it is necessary to protect and keep alive by making contemporary additions to historical buildings that cannot meet today's needs (Yüceer, 2005). There are different needs for adaptive reuse in buildings that have survived from ancient times to this day. Reconsideration and functionalization of every historical building in its built environment ensures the emergence of sustainable building designs (Eray et al., 2019). One the common strategies in adaptive reuse is the application of contemporary additions. The integration of contemporary additions differs from building to building, but also requires consideration of different parameters. The material selection, building element combinations, integration style and continuation of the historical building texture are some of them. Nanotechnological developments in structural systems also facilitate

the integration of building materials and elements (İlerisoy and Takva, 2017). The reasons for making contemporary additions vary and are explained in this section.

The need for a new space is one of the main reasons for making contemporary additions to historical buildings. Innovative additions are made in historical buildings damaged for various reasons, with the need to transform into different functions in today's conditions. Considering the user profile, suggestions should be developed for active use that does not disturb the traditional texture of the historical building. At this point, the exterior design of the building should be considered together with the interior design. It is necessary to make designs that attract users (Çakır et al., 2020). With the historical heritage has living areas, a prestigious step is taken in terms of social, economic and socio-cultural aspects. The introduction of versatile uses with flexible designs, and the development of energy-saving applications with ventilation systems also increase the recognition of the buildings (Takva et al., 2022; Seduikyte et al., 2018). A reason for making contemporary additions to historical buildings is the change of function. Since the necessary maintenance of unused buildings is not done regularly, they are damaged and destroyed over time. Historical buildings damaged for various reasons can be put into use with a different function, such as museums, art galleries and schools in today's conditions. In this context, contemporary additions should be made to meet the environmental factors and functional needs at the optimum level, with adaptive reuse (Yıldırım and Turan, 2012). With the implementation of the function change, arrangements are needed both in interior architecture and decoration and in exterior and environmental conditions.

In the process from the past to the present, differences of opinion have emerged between societies with different ethnic origins and views. Wars occurred because of this situation. Period buildings are among the damages caused by wars and occupations to societies. Destruction and damage to structures is also a measure of the scars left by wars. In this context, a reason for contemporary additions to historical buildings is the destruction due to war. Historical buildings damaged due to war are made compatible with today's usage conditions and can be put into use by completing the destroyed sections or by giving these sections a new function with contemporary additional buildings. After the Second World War, industrial heritage buildings in many European cities were repurposed and transformed (Aydın et al., 2022). A reason for contemporary additions to historical buildings is destruction due to fire. For historical buildings damaged by fire, measures are taken against fire and they are regain function. For example, Vezirköprü Taşhan, located in Samsun, surrendered to fire in the 19th century, but was added to the building stock because of adaptive reuse. The building, which was again affected by a fire disaster in 2014, was restored. Today, it serves as a restaurant and hotel (Yılmaz and Gül, 2015). Another reason for contemporary additions to historical buildings is destruction due to natural factors and disasters. Rain, snow, wind, temperature changes and changes in the hot-cold balance due to climatic conditions cause structural damage. Additionally, the continuity of these events and the lack of necessary maintenance cause damage. In addition to these, natural disasters such as earthquakes, floods, landslides and typhoons that occur suddenly as an unpredictable and unpreventable factor play a role in the significant damage to historical regions (İlerisoy et al., 2022; Ravankhah et al., 2019). Risk assessment should be carried out in historical buildings damaged by natural disasters, considering the disasters that have occurred in the past and that may occur in the future. Because of the risk assessment, measures that can be taken for contemporary additions based on adaptive reuse should be determined (Génova et al., 2018). In Table 1, historical buildings that exemplify the reasons for modern additions are given.

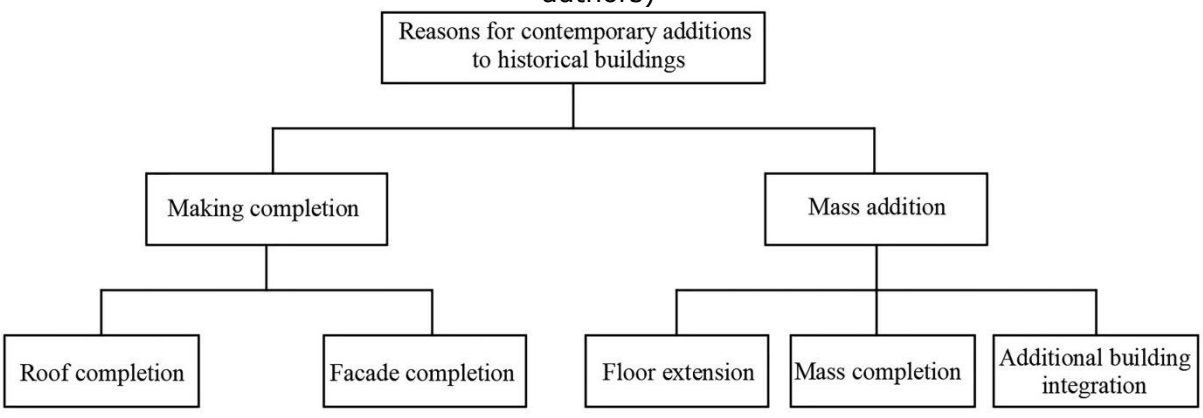
Table 1. Sample historical buildings that have been adaptive reuse by looking at the reasons for the contemporary addition (by the authors)

Need for new space	**Function change**	**Destruction due to war**
Zi Bo the Great Wall Museum of Fine Art 	Santa María de Vilanova de la Barca 	Reichstag Parliament Building 
Destruction due to fire		**Destruction due to natural factors and disasters**
Esma Sultan Mansion 		Sants Metges Hotel 

3. CONTEMPORARY ADDITION METHODS IN HISTORICAL BUILDINGS

Historical buildings are the urban memory of their surroundings. Along with the renewal and development of urban memory, historical buildings are also being transformed by technological methods. This transformation can be in the size of a small-scale building element or in the size of a large-scale building. There are different methods in the adaptive reuse process according to adaptation, protection, existing historical texture parameters. One of these methods is to make a contemporary addition. With the advent of modern building materials and construction systems, the application of contemporary additions is also facilitated. There are different contemporary additional construction methods for historical buildings. Contemporary addition methods to be applied in these structures are included in international declarations and regulations and should be applied in accordance with the procedure. Architectural analysis of environmental relations and facade, load-bearing systems and building relations should be made based on the characteristics of historical buildings. Contemporary addition methods are divided into two as completion and mass addition. In this section, these methods, which include the functions of the buildings, the reasons for contemporary additions, the original and current structural systems of historical buildings, are explained in detail. In Table 2, contemporary addition methods are shown as sub-headings.

Table 2. Methods for making contemporary additions to historical buildings (by the authors)



3.1. Making Completion

It is possible to complete the parts of damaged or destroyed historical buildings in a way that preserves the integrity of the building, which is in its original form but has disappeared due to the damage. To ensure the historical continuity of the buildings, the integrity of the building should be restored. The completion method can be performed in a part of the building, building elements, or construction systems. In Article 8 of the Carta Del Restauro Declaration and in the Article 12 of the Venice Charter, there are explanations for the applications for completing the missing sections in historical buildings.

3.1.1. Roof Completion

The roofs of historical buildings can be damaged by natural factors and disasters or by war and fire. A method used to eliminate these damages is the roof completion method. In this way, historical buildings can continue to be used by protecting them from climatic factors. Based on the samples examined within the framework of this approach, it was determined that the light structure building system was generally completed using transparent materials. In Table 3, sample historical buildings with contemporary additions on the roofs are presented.

Table 3. Samples of historical buildings whose roofs were completed because of adaptive reuse (by the authors)

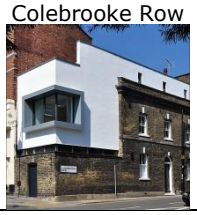
Building	Construction and adaptive reuse year	Location	Function	The Reason for addition	The structural system of the historical building	The structural system of the addition
Reichstag Parliament Building 	1894-1999	Germany	Parliament building	Devastation due to war	Masonry	Steel and glass
Salt Repository Medina Turgul DDB Headquarters 	1850s-2008	Turkey	Offices, meeting rooms, studio, library, and cafeteria	Destruction due to earthquake	Masonry	Steel and glass
Arenas de Barcelona 	1900-2011	Spain	Shopping, leisure and cultural center	Destruction by time	Masonry	Timber, steel and glass

3.1.2. Facade Completion

The facade of a building are one of the most important elements of building design. The building facades not only provide the connection between the interior and exterior environment in terms of architecture, but also reflect the cultural characteristics of the period in which they were built. According to the details of the construction system, windows, doors and decorations on the facades, the choice of form, material and color also changes. The effect of the facades is also important in creating the visual quality of the building. The characteristics and architectural identity of the facades also change according to the rhythm, proportion, balance, placement and number parameters (Yüceer and İpekoğlu, 2012). Facade configurations are also important in the context of adaptive reuse in historical buildings. Damages on the facades occur due to natural factors and disasters or unconscious interventions made for various reasons during the use of the building, and material losses are observed. Here, it should be applied considering

international declarations and regulations and by evaluating the facade completion specific to the building. Samples of historical buildings with facade completion are presented in Table 4.

Table 4. Samples of historical buildings whose facades were completed because of adaptive reuse (by the authors)

Building	Construction and adaptive reuse year	Location	Function	The Reason for addition	The structural system of the historical building	The structural system of the addition
Blencowe Hall 	1300s-2007	United Kingdom	Hotel, wedding venue and conference centre	Devastation due to war	Masonry	Steel and glass
Casa Sabugo 	1800s-2013	Spain	House	Destruction due to earthquake	Masonry	Timber, steel and glass
Extension-Colebrooke Row 	1727-2016	United Kingdom	House	Destruction due to fire	Masonry	Steel and glass

3.2. Mass Addition

Another method used in adaptive reuse applications of historical buildings is mass addition. Mass addition can be classified as floor extension, mass completion and additional building integration. The reasons for the massive addition are to maintain the integrity of the building, to provide structural stabilization and to create a building class that can meet today's architectural requirements by adding new spaces to the building. Mass additions to historical buildings should be carefully designed. Massive additions, which cannot meet the needs and spoil the character of the existing historical building, make it difficult to transfer to future generations and cause the loss of original qualities. For this reason, it is necessary to design and apply the mass additions in detail from the building material to the construction system. The original historical building should be touched as little as possible. The use of sustainable, environmentally friendly and recyclable building materials should be essential. The construction of the mass additions in a way that can be distinguished from the building and reflects the architectural character of the period in which it was built highlights the quality of the building. At this point, the resulting product brings together the old and the new and builds a bridge between the past and the present. In Article 7 of the Carta Del Restauro Declaration and in the Article 13 of the Venice Charter, there are explanations for completing the missing sections in historical buildings.

3.2.1. Floor Extension

A method used in the adaptive reuse of historical buildings is the addition of floors. In the examinations about the floor additions made to these buildings, it includes materials and structural systems contrary to the existing construction, but a harmonious combination is provided with the integration of the load-bearing system into the historical building texture. The additions used in the buildings are mostly completed using transparent materials on the light steel structured load-bearing system. The application of

contemporary additions rising in the vertical direction has attracted attention by increasing the visibility of the building. Generally, contemporary additions are planned with a different function than the current function of the historical building. Because of the fact that historical buildings cannot be used in the functions used in the past, expansions are made with the effect of the need for new space. Historical buildings with floor extensions are examined in Table 5.

Table 5. Samples of historical buildings with floor extensions because of adaptive reuse (by the authors)

Building	Construction and adaptive reuse year	Location	Function	The Reason for addition	The structural system of the historical building	The structural system of the addition
Moritzburg Museum 	1400s-2008	Germany	Art museum	Destruction by time	Masonry	Steel, glass and metallic roof with aluminum sheets
Rotermann's Old and New Flour Storage 	1904-2009	Estonia	Office, commercial and storage	Destruction by time	Masonry	Steel, glass, limestone walls, brick lintels and rusted steel details
Leszczynski Antoniny Manor Intervention 	1800s-2015	Poland	Healthcare and residential building	Destruction by time and need for new space	Masonry	Steel, cor-ten sheets and glass
Storyhouse 	1936-2017	United Kingdom	Theater, boutique cinema and a city library	Need for new space	Masonry	Steel, glass and copper-clad studio volume

3.2.2. Mass Completion

Another massive addition integrated into historical buildings is the massive completion of the building in a way that preserves its integrity. Mass completion is generally applied to contemporary building materials. A new awareness of architectural value is created without disturbing the history and architectural characterization of the building. The combination of the old and the new enables the questioning of contrast and harmony in architectural circles. Mass completion paves the way for the use of different functions in the building as well as provides a new space. Architectural samples where innovative and sustainable building materials add a new perspective to the original value of the buildings and are increasing day by day. Architectural samples are given in Table 6.

Table 6. Samples of historical buildings with mass completion because of adaptive reuse (by the authors)

Building	Construction and adaptive reuse year	Location	Function	The Reason for addition	The structural system of the historical building	The structural system of the addition
Convent de Sant Francesc 	1700s-2011	Spain	Cultural facility	Need for new space	Masonry	Steel, metal and glass
Bagrati cathedral reconstruction 	1000s-2012	Georgia	Religious use and touristic activities	Destruction in armed conflicts	Masonry	Steel and glass
Zi Bo the Great Wall Museum of Fine Art 	1943-2015	China	Fine arts museum	Destruction by time and need for new space	Masonry	Coated glass and gray patterned steel panel
Restored 19th-century home with corten addition 	1800s-2015	Italy	House	Need for new space	Masonry	Steel frame and glass

3.2.3. Additional Building Integration

Geometry plays a central role in buildings (Takva and İlerisoy, 2021). In historical buildings, additional building integration are made according to the geometry and architectural requirements of the building. Even if the geometry of the historical building consists of a regular geometric shape, we observe that integration of different geometric designs can be made. Table 7 shows samples of observed buildings. Integration can be made to existing historical buildings due to factors such as connecting between masses, semi-open or additional space. The designs also vary depending on the lack of functions and the size of the intervention. Applications that do not prevent the originality of the building by preserving the symbolic quality of the building should be planned. Change and transformation processes occur with the combination of technical and aesthetic parameters (Bloszies, 2013).

Table 7. Samples of historical buildings with additional building integration because of adaptive reuse (by the authors)

Building	Construction and adaptive reuse year	Location	Function	The Reason for addition	The structural system of the historical building	The structural system of the addition
Santralistanbul Energy Museum 	1911-2007	Turkey	Art and energy museum	Change of function	Masonry	Steel and glass
Louviers Music School Rehabilitation and Extension 	1659-2012	France	Music school	Need for new space	Masonry	Stainless steel, precast concrete panel walls and glass
Renovation of the Oscense Theatre 	1800s-2013	Spain	Theater and cultural use	Need for new space	Masonry	Wood and concrete
Tornhuset 	1910-2014	Sweden	World Maritime University	Need for new space	Masonry	Steel, glass, aluminum and metal sheets
Malmö Market Hall 	1800s-2016	Sweden	Market Hall	Need for new space	Masonry	Corrugated steel and glass
Sants Metges Hotel 	1800s-2018	Italy	Hotel, swimming pool and restaurant	Need for new space	Masonry	Steel, concrete and glass

4. CONCLUSION

Historical buildings bear various traces of the period they were built. It provides information about the geographical, climatic and architectural data of the region because of the social, cultural, economic situation, behavior and experiences of the individuals living in the built environment. In this context, historical buildings reflect the character and identity of a society in its period. Historical buildings that make up the social memory face the danger of being worn out and destroyed due to various reasons over time. This results in the erasure of the traces of the past. Historical buildings, which are a document of the past of societies, should be updated to meet the needs and problems of the period in which they were built. To carry the past to the future, the adaptation of historical buildings to today's conditions is provided with different planning and techniques. One of these techniques is the adaptive reuse strategy. This strategy uses technological construction systems and methodologies to keep up with today's conditions of historical buildings in the architectural context.

Within the scope this study, the issue of making a contemporary addition to historical buildings, which is one of the adaptive reuse techniques, is examined. In the buildings examined, the need for new space, change in function, the transformation of historical buildings destroyed due to war, fire and natural factors are discussed. It can be seen that innovative building materials are used in all of the sample buildings. It has been observed that steel, glass, concrete, metal, aluminum and composite building materials are integrated. The nature and construction rules of the contemporary additions to be made are specified in various international declarations and regulations. In these declarations and regulations, it is explained that contemporary additions to historical buildings should be in harmony with the historical structure, but that the additions should reflect the character of the period and the difference between the past and the present should be stated. Similarities and contrasts stand out in the relationship between old-new and existing-added in terms of form, space and expression. To ensure this relationship, careful treatment should be given, preserving the original character of the building and preventing its destruction. Keeping the historical buildings alive and establishing a healthy bridge between the past and the present will facilitate the transfer to future generations.

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