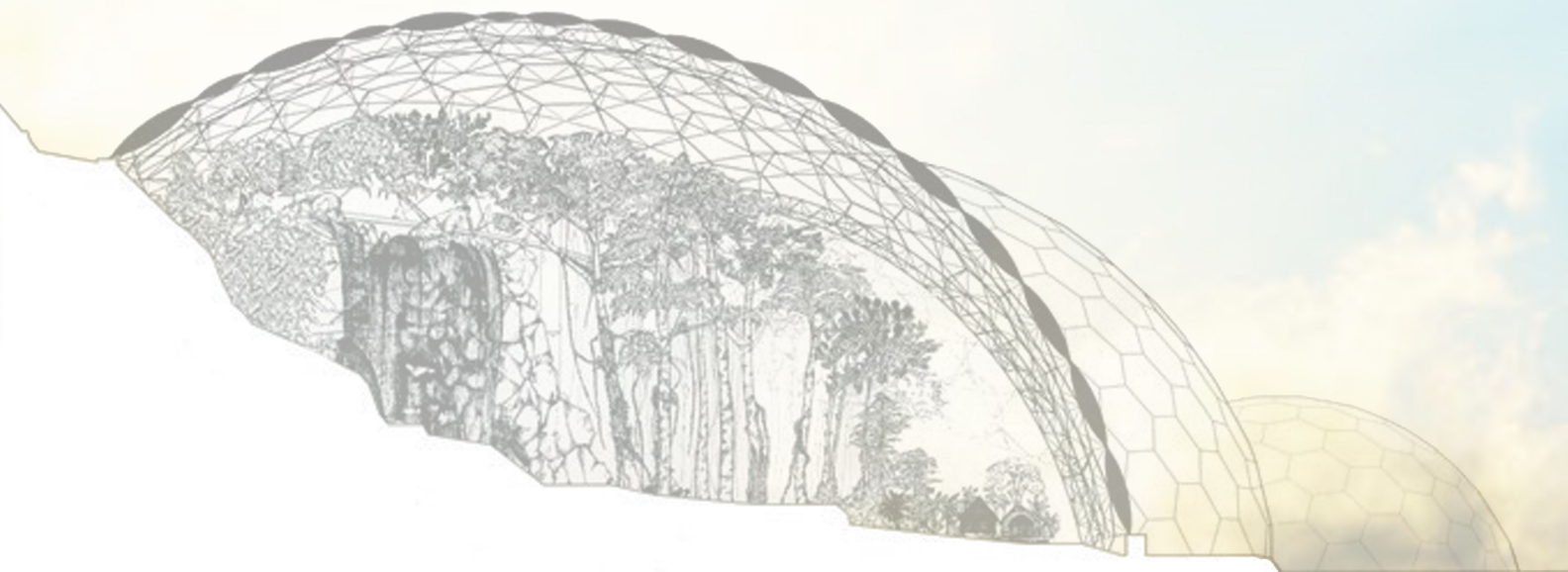


THE EDEN PROJECT BIOMES

History & Theory
Post 1945 Building

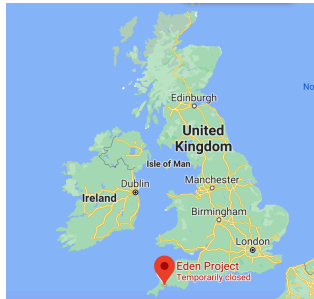
Benjamin Lloyd Howells (1907786)

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Introcuction

The Eden Project in Cornwall, England, is a visitor and education centre (Figure 1). The complex is dominated by two large adjoining biomes that house diverse plants and environments from around the world (Figure 2). The largest biome imitates a rainforest environment (largest indoor rainforest in the world) and the other, a Mediterranean environment. The attraction also has an outside botanical garden that is home to many plants and wildlife native to Cornwall and the UK in general (Dahedar, 2020).



(Figure 1) Location of the Eden Project in the UK (Google maps, 2021)



(Figure 2) The two Eden Project biomes dominating the complex. (Dahedar, 2020)

Post World War II, the advancement in technology, manufacturing and understanding of materials shifted an architectural movement towards modernism (Hoffmann, 2021). The movement followed two key principles; form follows function, and truth to materials (Hoffmann, 2021). This means that the building's use should be considered over how it looks and the materials should resemble the building's purpose. The increased attention that was given to climate change by scientists and media coverage in the late 1980's further emphasised these principles as architects aimed to place emphasis on sustainability (Global Warming Timeline, 2021). The Eden Project is particularly interesting as the project's aims and architectural aspects respond to the above. Sir Tim Smit came up with the idea of the Eden project in the mid 90's and Grimshaw was assigned as the architect.¹ This project repurposed a non-functional china-clay pit into a botanical garden. A deserted site to a flourishing

¹ Sir Tim Smit was born in Holland in 1954. At Durham University he studied Archaeology and later went on to join the music industry as a composer and producer.

nature environment that harmonises humanity and nature shines through the key tourism and educational programmes run at the project. The highly sophisticated architectural design plays a significant role in achieving this.

This essay will aim to address:

- Why Grimshaw was chosen as the architect,
- Key architectural interests of the Eden project's biomes.
- Drawing comparisons with similar structures in order to conclude on whether the architecture of the Eden biomes achieves the projects aims to its full potential.

The beginning of Eden

The primary innovation for the project derived from Sir Arthur Conan Doyle's novel "Lost World". The novel features a strong notion that a bounty was placed upon the earth, as a guide showing there was a lost civilisation within the world due to the lack of respect given to natural abundance by humankind. The message of the novel clearly relates to the Eden project's intention of galvanising the human/nature relationship and connectivity. The landscape and environment of Roraima, where the novel was set in and the location of the Eden project are distinctly comparable (Architects, G. , 2016).²

The project is situated on an old clay pit. Sir Tim described the original landscape as resembling the surface of the moon, a reference to the white tips and pits caused by the extraction of Kaolin from the ground (Architects, G. , 2016). The old 14 hector Bodelva pit left a sheltered south-facing curve surrounded by parkland (Davey, 1996). Cornwall is the mildest climate in the British Isles, with tropical winds, lavish rainfall and a relatively balanced day length (Davey, 1996). These climatic elements rendered the location as one of the best in Western Europe for the experiment with opportunities for developing sustainable methods. Cornwall's historical connections to plants and the restoration of the Heigan House gardens in 1987 by Tim Smit also played a vital role in the early

² The location that features in the novel, Roraima Straddling, which borders between Venezuela, Brazil and Guyana, is described as being home to diverse unique plants and wildlife due to its topographical elements and tropic climates. Steep cliff edges provide shelter and isolation for the plants and wildlife from any destruction including from humans.

stages of developing the project idea.³ The success of the restoration demonstrated the positive impact that such projects had on the local community, particularly by attracting large amounts of tourists. These factors, alongside the British history of greenhouse architecture and the modern movement, galvanised Tim Smit's ambitions to make the Eden project a successful reality.

The Architect - Nicholas Grimshaw

Grimshaw was born in 1939. From a young age, influenced by his upbringing and his family's success in art and engineering, Grimshaw had a keen interest in how things were constructed (Frearson, 2015).⁴ Grimshaw graduated from Architectural Association in London in 1965. His first 15 years as a practicing architect was spent in partnership with Terry Farrell whilst sharing an office with architect Peter Cook (Frearson, 2015). The influence of both architects was prevalent in Grimshaw's early designs.. Farrell's influence was prevalent in the Farrell/Grimshaw partnership during the 125 Park Road, London residential building. Described as a pioneering example of British High-Tech Style, the partnership designed the external steel frame to be the entirety of the structural element. This allowed for the internal residential flats to be modular and flexible for future uses of the building (Frearson, 2015).⁵ Grimshaw expressed his desire to succeed in the functionalism of high-tech movement by designing the financial Times Paperworkes in 1988. The design contained a glazed flanked façade that showcased the inner functions of the paperwork to the outside viewer (Frearson, 2015). The external steel outriggers that holds the glass wall and the visible cornice of perforated steel tie-beams, was deemed as ornamentation. Jean Muir described how this building emphasises Grimshaw's understanding of

³ Historic values of the area further amplified the prospects of the location being successful. In the 18th and 19th century the ports in Cornwall were the first landfalls for sea captains. This is key as captains such as captain Cook and Sir Joseph Banks, who was a botanist, showed a great interest in the locality's flora and fauna. This led to plants, in particular medicine plants being introduced to the gardens of Cornwall's great country houses, one of which being Heligan House.

⁴ Grimshaw's mother and grandmother were both artists and his father and great grandfathers were successful aircraft and civil engineers. This played a significant role in Nicholas Grimshaw becoming an architect. During a BBC interview in 2003, Grimshaw described how his childhood was orientated around a fascination with constructing tree houses and understanding how boats were constructed.

⁵ Grimshaw's principles of designing for the future with flexible internal spaces was later seen in the Miller Factory which was designed so that the building that could be completely reconfigured in the future.

architecture and his ambition to express and collaborate engineering into his design (Pearman, 2019).⁶ Later, the commissioning of the Waterloo station, which won the RIBA Building of the Year Prize and the Mies Van Der Rohe Award, became the foundation of Grimshaw's architectural reputation and legacy (Frearson, 2015).

Design and structure of the biomes

The main challenge that Grimshaw faced whilst designing the Waterloo station was to create a roof structure and envelope that followed the twisting and diminished geometrical form of the train tracks (Figure 3). This was a milestone for Grimshaw and even more so for the architectural high-tech movement (Pearman and Whalley, 2003). This was a prime example of one of the first buildings that was designed using computer generated three-dimensional forms (Pearman and Whalley, 2003).



(Figure 3) Roof structure of Waterloo Station. (Grimshaw Architects, 2021)

The two main contenders to be commissioned for the Eden project were Nicholas Grimshaw and Renzo Piano (Pearman and Whalley, 2003). Both were seen as high-tech architects. Grimshaw had recently completed the Waterloo station and Piano had recently completed the Kansai Airport in Japan (Pearman and Whalley, 2003). Both projects were transport interchange buildings that were commended for their advanced glazing systems. It was deemed that Grimshaw's Waterloo organic curvature form resembled the old pit landscape and would better suit the Eden project (Pearman and Whalley, 2003). Grimshaw used the same team that designed the Waterloo project to develop and design the Eden Project. They developed a proposal that utilised the multisized arching system previously used in the Waterloo project (Pearman and Whalley, 2003).

⁶ Jean Muir, a fashion designer was an RIBA judging 1980's. She described the Financial Times Paperworks building as being like "...an inlaid jewel box". (Pearman, 2019)



(Figure 4) Initial concept designs.
(Grimshaw Architects, 2021)

It was anticipated the Eden structure would have a curving and undulating roof that would follow the landscape of the old pit wall, with an open plan central area for the planting (Figure 4). Estimated to cost £106m, this

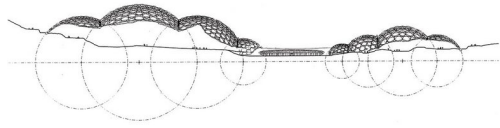
proposal was rejected by the millennium commission due to the cost and fears that the project would not succeed. Grimshaw and his team then turned to Buckminster Fuller's geodesic dome principle (Pearman and Whalley, 2003). Developed by Fuller, with the aim to find a structure that would have least impact on the surface area with maximized enclosure (Rose, 2007). The geodesic dome principle is demonstrated in his Pavilion at Expo '67 in Montreal. However, the acrylic cladding panels used were later found not to be fire retardant and were devastated in a fire. Although the structural frame remains, the impacts of the fire was also an example of how some architects ideas came before their time due to lack of technology and materiality knowledge (Figure 5). However, by the 1990's, technology and understanding of materials were more advanced and Grimshaw saw this as an opportunity to develop on Fuller's geodesic dome principle.



(Figure 5) Pavilion at Expo '67 in Montreal. Geodesic dome structure still remains. (Martin, 2016)

During the design process, the Eden project did not have ownership of the land and mining for the Chinese clay continued. Due to the continuous change in ground level, the design team resorted to changing the sphere shape of the dome into a series of bubble elements that collectively made up the dome shape. This was based on the fact that bubbles are flexible and adapt their shape to the surface that they sit upon. When construction of the Eden project began, this design principle facilitated for the sphere of bubbles to be carved to the shape of

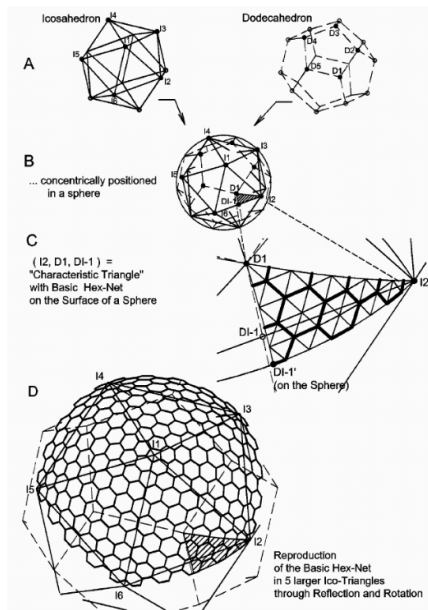
the surface with minimal impacts on the design and layout (Pearman and Whalley, 2003) (Figure 6).



(Figure 6) image showing hoe the sphere principle was used and then cut to the shape of the pit surface. (Grimshaw Architects, 2021)

Grimshaw and his team aimed to contextualize the Eden structure with the landscape of the old mine. The arched steel trusses form the basis of the structure (Kori, n.d.). Pin joints were then fixed into the top of the rock walls round the pit and old quarry (Davey, 1996). The span and height of the roof structure continuously changes in symmetrical form in accordance to the landscape. The width of the structure ranges from 15m to 120m (Kori, n.d.). This required each truss to be individually calculated, a technical and analytical approach that truly resembles the partnership's technical reputation gained from the Waterloo station project (Davey, 1996). A feature that makes the architecture of the domes unique is that the initial design of the basic geodesic dome was developed into a double structural framed biome (Figure 7). The outer frame is designed from hexagonal and occasional pentagonal elements. The inner frame comprises of hexagons and triangles as a semi-base element (Figure 8). The connection of the two structures by the node points provides a rigid structure (Figure 9). Similarly to Farrell/Grimshaw's 125 Park Road residential building, the external structure of the Eden dome is the sole structural element. The wide span and open-plan element provided a blank canvas for the internal space to be designed, with ample space for circulation and various size plants. This Hex-Tri-Hex structure also provides each ETTC cladding pillow to span over a greater surface with minimal structural interaction, providing an amplified indoor environment for plants as solar and UV gain is maximized (Kori, n.d.). From the internal perspective, the minimal structural design amplifies the occupier's sense of being immersed in the centre of nature. Economically, this design reduced the quantity and mass of the structural frame, reducing cost as a result (Knebel, Sanchez and Zimmermann, 2001). The structural frame and choice of materials render the biomes only as heavy as the weight of the air inside. This was an integral aspect of the design to ensure that the domes

responded to the terrain and unsteady ground of the old pit. To achieve this, Grimshaw was influenced by honeycomb of bees and multifaceted eyes of insects (Bissegger, 2006). These creatures utilise their natural surroundings to construct strong but light structural elements (Bissegger, 2006). Grimshaw respond to the brief of the Eden project by resorting to organic forms and methods.



(Figure 7) diagrams showing the evolution progress of the structure to the final Hex-Tri-Hex design. (Knebel, Sanchez and Zimmermann, 2001)



(Figure 8) The biomes double structure shapes. (Knebel, Sanchez and Zimmermann, 2001)



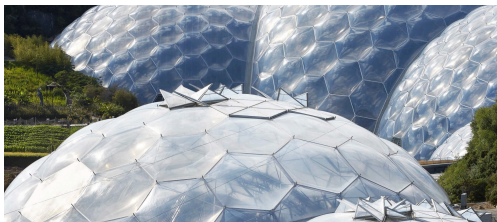
(Figure 9) Node point connection. (Knebel, Sanchez and Zimmermann, 2001)

The cladding

Over 800 ETTC three layered pillow-cladding elements cover the structural frames of the biomes (Knebel, Sanchez and Zimmermann, 2001). The cladding system is connected to an air supply system that inflates the pillows. The air pumps are generated by solar powered technology and the system can adapt the airflow rate within each pillow (Davey, 2000). Firstly, the system can aid with controlling the internal climate by pumping warm air into the pillows. The air within the pillows acts as a thermal air pocket, reducing heat loss from the biomes (Knebel, Sanchez and Zimmermann, 2001). Secondly, the cladding system reacts to the external elements. Increased air pressure into a pillow can prevent substantial damage from leakages and the smooth curvature surface provides the cladding with a self-cleaning property.

Ventilation

A special ventilation system designed by Ove Arup & partners is integrated into the domes. This is to ensure that the tropical environment is maintained whilst also providing a suitable climate for visitors. The 5 hexagons surrounding the top pentagon have been divided into 3 triangles. Each dome has 30 remote controlled operated openings (Figure 10). The positioning of the openings was determined by implementing the physics principle of heat rising (Knebel, Sanchez and Zimmermann, 2001).



(Figure 10) (Grimshaw Architects, 2021)

Comparisons with other buildings

When assessing the Eden biomes architectural success, comparisons to similar buildings and projects should be made.

Firstly, a comparison could be made to Joseph Paxton's, Crystal Palace. Designed in 1850, the building shared similar functions to the Eden Project and was described as an "ingenious exhibition space" (Importance of the Great Exhibition of 1851, 2018). The structure consisted of more than a 1,000 iron columns and 84,000m² of glass. Similarly to the Eden biomes, Paxton strived for a maximized glazing for light and a low cost self-supporting external structure that would increase flexibility of the internal space (Figure 11). This was an ambition that he was deemed to have achieved. Paxton's simple but effective design allowed an efficient construction process that only took 5 months (Pearman and Whalley, 2003). In comparison, the Eden biomes required a world record-breaking amount of scaffolding to construct the complex double structure. However, the double structure of Eden biomes facilitated for larger spans of cladding with a reduced interruption of structural elements. The largest ETTC cladding panel reaches spans of 11m (Figure 12). This compares to the maximum 10inchx49inch sized glazing used in the Crystal Palace (Pearman and Whalley,

2003). This showcases how the development of technology by the late 90's had evolved, providing more ambitious and in some sense more successful buildings.



(Figure 11) Internal image of Paxton's Crystal Palace. Image shows the glass structure. (Crystal Palace | Description, History, & Facts, n.d.)



(Figure 12) Internal image of the Eden Project biomes. Image shows the large cladding panels. (Grimshaw Architects, 2021)

Secondly, comparison can be drawn from Foster+Partners NBGW great glasshouse.⁷ Both projects share similar principles. Like the Eden biomes, the Great glasshouse is primarily south facing and uses the landscape as protection from the elements and for thermal gain. However, critics argue that the large spanning and heavy glass curtain wall structure of the Great Glasshouse, does not successfully blending in within the rolling hills and surrounding topography (Contributor, 2000) (Figure 13). It could be argued that the unusual façade of the Eden biomes do not fit in with it's surroundings. Although the structure gives reference to the topographic surrounding of the old pit, Grimshaw did not attempt to subtly hide the structure into the landscape. However, this design successfully regenerates the old brownfield site into a unique place and a focal point for the area. The light structure and organic form of bubbles provide the sense that the structure is inflating and deflating out of the walls of the pit like a pair of lungs breathing life back into its surroundings (Figure 14).

⁷ National Botanic Garden of Wales (NBGW)



(Figure 13) The National Botanical Garden of Wales dome in its context. (Stock, 2013)



(Figure 14) The Eden Project Biomes bubbling out of the landscape. (Grimshaw Architects, 2021)

Thirdly, much of the architectural ethos of the Eden biomes demonstrates how technology and advancement allowed the structure to be self-sustaining and control the internal climate. This was not a new concept however. Sir George Mackenzie and John Loudon drew up proposals in the 1810's for glasshouses that would curve with the orientation of the sun to maximize light and the use of a "automaton gardener" machine that would control the internal climate (Pearman and Whalley, 2003). Grimshaw Eden biomes design doesn't seem to be authentic in their entirety, as Grimshaw drew his influences from existing principles. However, Grimshaw developed and made these ideas into functional and adequate sustainable designs.

Impacts on the close and wider community

Within the first 5 years of opening, visitors who went to Cornwall to visit the Eden Project contributed £700m to the local economy (Simpson, 2006). The core employment at Eden had settled at around 400 (Simpson, 2006). The Eden project claims that majority of these workers are from the local area with an additional 150 seasonal workers recruited annually. From the beginning, the Eden project adopted a principle whereby they source supplies, wherever possible, from Cornish companies. The project bought from 3,000+ Cornish firms in 2006 (Simpson, 2006). These facts provide unequivocal evidence that the Eden project has and continues to play a pinnacle role in contributing to the surrounding community and economy.⁸ However, a report released by Future

⁸ The 2005 'South West Economic Review' edited by Professor Peter Gripaios of Plymouth University Business School referred to the Eden Project as "A Beacon of Hope" when describing the projects success in regenerating the South-West of England (Simpson, 2006)

Forests whom measure carbon dioxide emissions, calculated that 750,000 cars visiting the attraction annually would release 5,205 tonnes of carbon into the local environment (Townsend, 2002). Friends of the Earth spokesman for Exeter, Maurice Spurway, urged the closure of Eden's 3,500 space car park and Green campaigners accused the project of being 'contradictory' with it's principles (Townsend, 2002). Considering that the project's aims are to influence a positive culture change whilst providing a vision for sustainable future by addressing human behaviours, the pollution generated by transport to the venue is a grave issue with environmentalists deeming the project as "a victim of its own success". Questions also remain over the 30-year longevity of the structural frame and the use of core materials that were needed to create the structural elements and the ETTC cladding (JONES, n.d.).

Conclusion

The architecture of the Eden project Biomes clearly responds to the design brief. The complex self-supporting external frame with its span creates the required factors that were needed to host the largest indoor rainforest in the world. Grimshaw showed integrity for his architectural principles, that he developed from the beginning of his career, by creating a flexible internal space and achieving to capitalise on Fullers geodome by adapting it into a double structure, demonstrated exemplary engineering design. This structure also addresses past greenhouse architecture obstacles when trying to amplify solar gain. The self-sustaining and climatic control elements of the architectural design also capitalises on the projects aims to provide education. Subsequently this has resulted in the Eden project becoming a pioneer project with other Eden projects currently being built in the North of England and Qingdao in China. Tourist statistics demonstrate the success of the Eden project. The architecture showcases how the development of technology and understanding of materials equips the field of architecture with the ability to design for a sustainable future with better connectivity between humans and nature.

Word Count- 2,728 (Excluding references and titles)

References

- Architects, G., 2016. The Eden Project. [online] Youtu.be. Available at: <<https://youtu.be/wuOjoU27wx4>> [Accessed 8 March 2021].
- Contributor, A., 2000. Great Glasshouse by Foster + Partners. [online] The Architects' Journal. Available at: <<https://www.architectsjournal.co.uk/archive/great-glasshouse-by-foster-partners>> [Accessed 8 March 2021].
- Bissegger, K., 2006. The Eden Project. [online] Webpages.uidaho.edu. Available at: <<https://www.webpages.uidaho.edu/arch504ukgreenarch/casestudies/edenproject1.pdf>> [Accessed 8 March 2021].
- Dahedar, S., 2020. THE EDEN PROJECT : A GARDEN IN MOVEMENT OR A PLANETARY GARDEN?. [online] IAAC. Available at: <http://www.iaacblog.com/programs/the_eden_project_a_garden_in_movement/> [Accessed 7 March 2021].
- Davey, P., 1996. The genesis of Eden. The Architectural Review, 199(1189), pp. 65.
- Davey, P., 2000. Eden projected. The Architectural Review, 207(1238), pp. 76-77.
- Encyclopedia Britannica. n.d. Crystal Palace | Description, History, & Facts. [online] Available at: <<https://www.britannica.com/topic/Crystal-Palace-building-London>> [Accessed 17 March 2021].
- Frearson, A., 2015. Nicholas Grimshaw maintained his high-tech ideals for 50 years. [online] Dezeen. Available at: <<https://www.dezeen.com/2019/11/15/nicholas-grimshaw-high-tech-architecture/>> [Accessed 8 March 2021].
- Grimshaw Architects, 2021. [image] Available at: <https://grimshaw.global/projects/gallery/?i=577&p=96008_N223_a3> [Accessed 17 March 2021].
- JONES, A., n.d. Creating Eden in Cornwall The civil and structural design of the Eden Project. [online] Ingenia.org.uk. Available at: <<https://www.ingenia.org.uk/getattachment/Ingenia/Issue-7/Creating-Eden-in-Cornwall-the-civil-and-structural/Jones.pdf>> [Accessed 10 March 2021].
- Hoffmann, H., 2021. Western architecture. [online] Encyclopedia Britannica. Available at: <<https://www.britannica.com/art/Western-architecture>> [Accessed 12 March 2021].
- History.aip.org. 2021. Global Warming Timeline. [online] Available at: <<https://history.aip.org/climate/timeline.htm>> [Accessed 12 March 2021].
- Kori, S., n.d. Case study on Eden Project, UK Design Solution. [online] Scribd.com. Available at: <<https://www.scribd.com/document/413639934/Archi-Case-study-on-Eden-Project-UK-Design-Sol-pdf>> [Accessed 9 March 2021].
- Knebel, K., Sanchez, J. and Zimmermann, S., 2001. The Eden Project - Design, fabrication and assembly of the largest greenhouse of the world. [online] ResearchGate. Available at: <https://www.researchgate.net/publication/294617101_The_Eden_Proj>

ect_-

_Design_fabrication_and_assembly_of_the_largest_greenhouse_of_the_world> [Accessed 8 March 2021].

- Martin, H., 2016. Buckminster Fuller's Geodesic Dome and Other Forward-Looking Architecture. [online] Architectural Digest. Available at: <<https://www.architecturaldigest.com/gallery/buckminster-fuller-architecture>> [Accessed 15 March 2021].
- Pearman, H. and Whalley, A., 2003. the architecture of eden. 61-63 Uxbridge Road, London, W5 5SA: Transworld Publishers, pp.19-27.
- Pearman, H., 2019. Sir Nicholas Grimshaw: Reflections. [online] Ribaj.com. Available at: <<https://www.ribaj.com/culture/royal-gold-medal-grimshaw-reflections>> [Accessed 10 March 2021].
- Rose, S., 2007. Bubble Vision. [online] the Guardian. Available at: <<https://www.theguardian.com/artanddesign/2007/oct/12/architecture2>> [Accessed 8 March 2021].
- Simpson, D., 2006. Eden Project boosts Cornish economy. [online] Cabi.org. Available at: <<https://www.cabi.org/leisuretourism/news/15941>> [Accessed 6 March 2021].
- Stock, B., 2013. Wales, UK, June 4, 2013. 2015. National Botanic Garden of Wales, Llantharne, Carmarthenshire. [image] Available at: <<https://www.shutterstock.com/es/image-photo/wales-uk-june-4-2013-2015-677259496>> [Accessed 17 March 2021].
- Townsend, M., 2002. Car fumes blight Eden's green vision. [online] the Guardian. Available at: <<https://www.theguardian.com/environment/2002/jun/02/travelandtransport.theobserversuknewspages>> [Accessed 10 March 2021].
- UKEssays. November 2018. Importance of the Great Exhibition of 1851. [online]. Available from: <https://www.ukessays.com/essays/architecture/the-importance-of-the-great-exhibition-1851.php?vref=1> [Accessed 10 March 2021].

Bibliography

History and theory lecture notes (M5X01981)

<https://www.ukessays.com/essays/architecture/the-importance-of-the-great-exhibition-1851.php?vref=1>

<https://www.theguardian.com/environment/2002/jun/02/travelandtransport.theobserversuknewspages>

<https://www.shutterstock.com/es/image-photo/wales-uk-june-4-2013-2015-677259496>

<https://www.cabi.org/leisuretourism/news/15941>

<https://www.ribaj.com/culture/royal-gold-medal-grimshaw-reflections>

<https://www.architecturaldigest.com/gallery/buckminster-fuller-architecture>
https://www.researchgate.net/publication/294617101_The_Eden_Project_-_Design_fabrication_and_assembly_of_the_largest_greenhouse_of_the_world
http://www.iaacblog.com/programs/the_eden_project_a_garden_in_movement/
<https://www.google.com/maps/place/Eden+Project/@52.0672644,-8.819>
<https://www.bbc.co.uk/bitesize/guides/zpykxsg/revision/3>
<https://www.britannica.com/art/Western-architecture>
<https://www.architectsjournal.co.uk/archive/another-grimshaw-building-listed>
<https://en.wikiarquitectura.com/building/eden-project/>
<https://www.designboom.com/architecture/eden-project-video-grimshaw-worlds-biggest-greenhouse-12-15-2016/>
<http://www.robaid.com/bionics/green-architecture-eden-project-in-uk.htm>
<https://www.ingenia.org.uk/Ingenia/Articles/ce67feee-6264-4c9c-bfab-a2ba4aa924d4>
https://getrevising.co.uk/grids/the_eden_project
<http://www.tremorvah.co.uk/media/3638505/TheEdenEffect1.pdf>
<https://land8.com/is-the-eden-project-the-birth-of-a-new-beginning/>
<https://www.edenproject.com/eden-story/our-ethos/eden-project-international>
<https://www.architectsjournal.co.uk/archive/great-glasshouse-by-foster-partners>
http://www.fourthdoor.org/annular/?page_id=447
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925231/Net_Zero_and_Sustainability_Annex_August_2020_.pdf
https://www.researchgate.net/publication/266866588_The_Eden_Project_-_making_a_connection
<https://www.cabi.org/leisuretourism/news/15941>
<https://www.scienceabc.com/innovation/what-is-organic-architecture.html>
<https://www.studymode.com/essays/Eden-Project-Case-Study-1465811.html>
<https://www.architectsjournal.co.uk/news/opinion/a-lesson-from-history-the-untoldeden-project-scandal>
<https://www.economist.com/britain/2000/11/16/the-good-the-bad-and-the-fast>
<https://www.theguardian.com/environment/2002/jun/02/travelandtransport.theobservernewsuknewspages>

<https://www.ice.org.uk/what-is-civil-engineering/what-do-civil-engineers-do/the-eden-project>

<https://www.detail-online.com/magazine/the-eden-project-cornwall-15769/>

<https://inspiration.detail.de/the-eden-project-cornwall-106839.html>

<https://www.ajbuildingslibrary.co.uk/projects/display/id/2188>

<https://www.ingenia.org.uk/Ingenia/Articles/ce67feee-6264-4c9c-bfab-a2ba4aa924d4>

<https://www.thirdsector.co.uk/analysis-eden-project-weathering-a-perfect-storm/finance/article/1230503>

<https://www.bbc.co.uk/news/uk-england-cornwall-18232261>