Science and Technology Presentation

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Figure 1 . More or less bone (Jean-Luc Moulène, 2018-19)

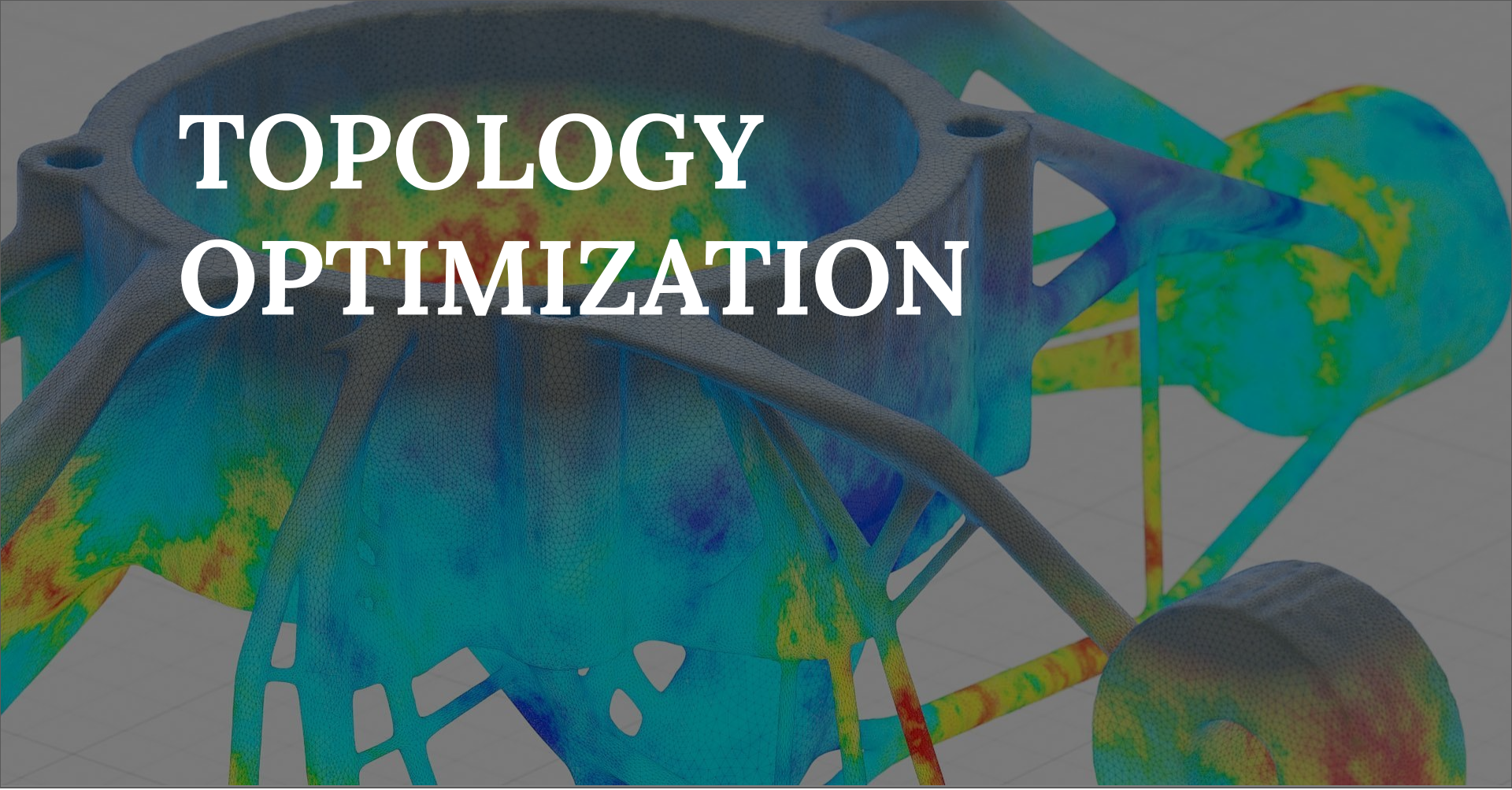


Figure 2 . How is topology optimization different (Autodesk ,2019)

Two Advantages of Topology Optimization

- Performance Aspect
- Aesthetic Aspect

Performance of the Topology Optimized Structures

- Light-weight objects with better load carrying capabilities
- Natural formed truss structures

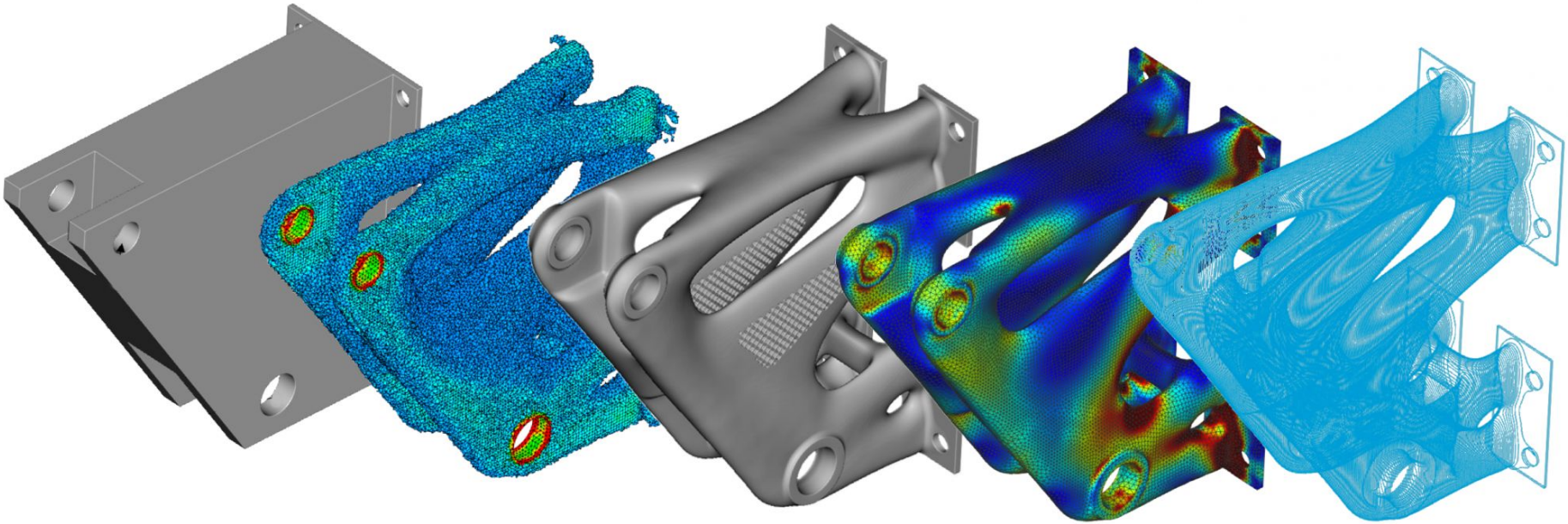


Figure 3 . Topology optimization progression (Trevor Laughlin, 2019)

Figure 4 . Topology optimization and additive manufacturing of Airbus A320 nacelle hinge bracket (Tomlin M, Meyer J 2011)

Literature

“Topology optimization has become an effective tool for least-weight and performance design, especially in aeronautics and aerospace engineering.”

(Zhu, J.-H., Zhang, W.-H., & Xia, L. 2015, p. 595).

Aesthetic Aspect of the Topology Optimized Structures

Shape and topology optimization for conceptual architectural design

- Biomimetic aesthetic approach to the design
- Evolutionary aesthetic approach to the design

Figure 5. Qatar National Conference Centre (Wikipedia, 2018)

Literature

“Shapes obtained as the result of a shape and topology optimization procedure are frequently characterized by a strong organic nature . This is not a coincidence, since such shapes exhibit an optimal mechanical response to the applied loads, in a similar way as those found in nature. One famous example of shape optimization in nature concerns the evolution of trees , which is guided by the necessity to withstand wind and to maximize their capacity to collect nutrients. “

(Dapogny et al., 2017,p. 935)

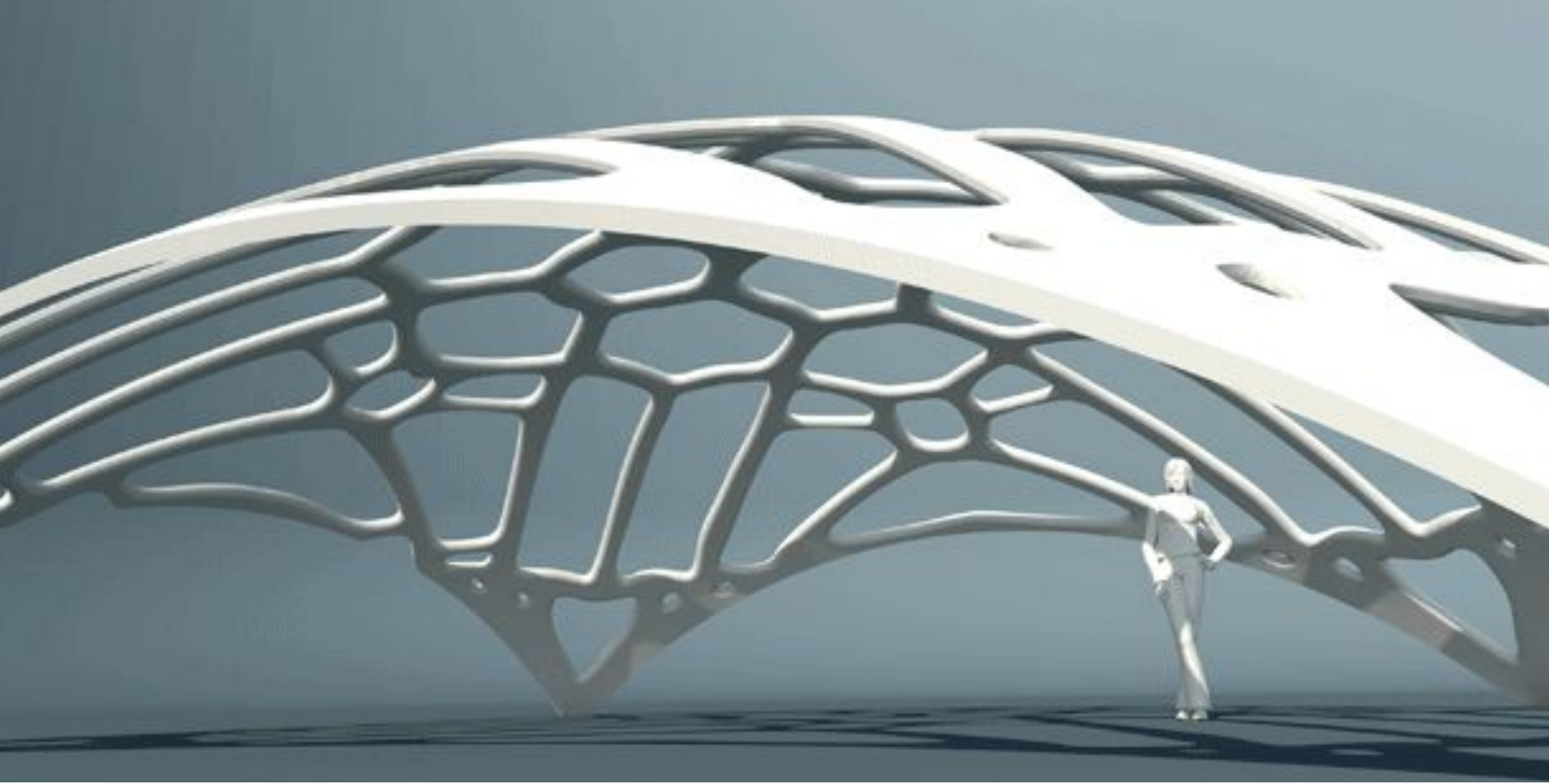


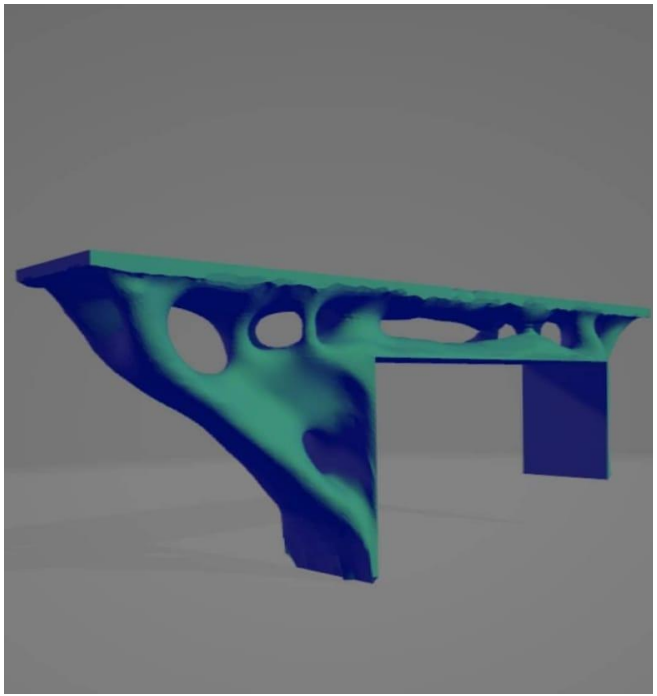
Figure 6. Shell lattice structure (Unikabeton, 2018)

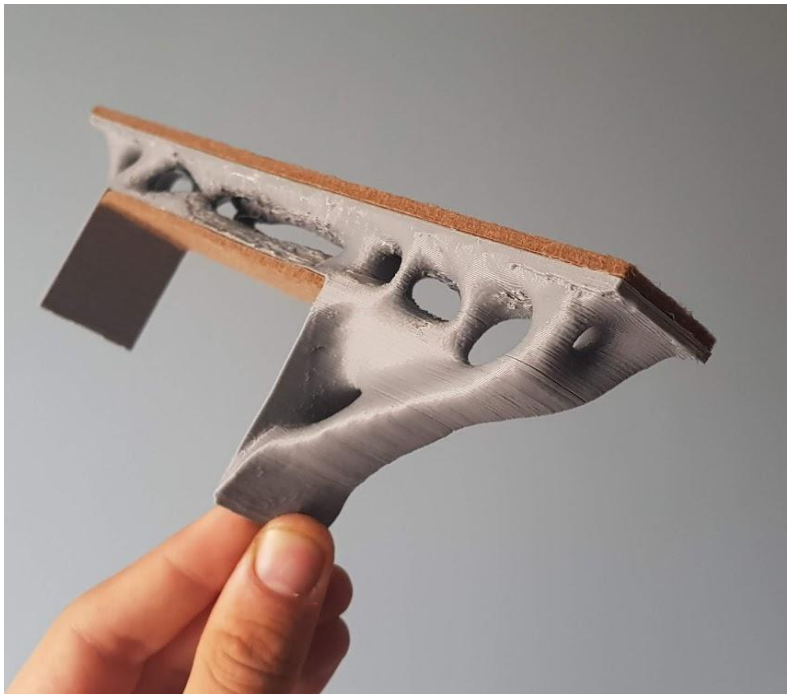
Literature

“ Shape and topology optimization methods turn out to be a natural way to mimic the rules of biological growth and produce non intuitive shapes. Let us mention that famous architects, such as Antoni Gaudi and Frei Otto, have extensively used such models in their works, either by directly taking inspiration from natural shapes or by performing simplified experiments under gravitational loads“

(Dapogny et al., 2017,p. 936)

My Experiences





My Experiences

Conclusions

References

Dapogny, C., Faure, A., Michailidis, G., Allaire, G., Couvelas, A., & Estevez, R. (2017). Geometric constraints for shape and topology optimization in architectural design. *Computational Mechanics*, 59(6), 933–965. doi: 10.1007/s00466-017-1383-6

Qatar National Conference Centre. (n.d.). photograph. Retrieved from https://www.aedas.com/en/what-we-do/arts-team/conferences/qatar-national-conference-centre

Zhu, J.-H., Zhang, W.-H., & Xia, L. (2015). Topology Optimization in Aircraft and Aerospace Structures Design. *Archives of Computational Methods in Engineering*, 23(4), 595–622. doi: 10.1007/s11831-015-9151-2