

ADVANCED COMPOSITES

WITH DR R. BYRON PIPES

Talking points

KNOWLEDGE:

1. Which aspects of the project was Byron's team at Purdue University responsible for?
2. Which structural behaviours were the team tasked with studying?

COMPREHENSION:

3. Why do you think the stadium torch project started with the aesthetic requirements before practical and feasibility studies?
4. Why was carbon fibre-reinforced polycarbonate composite chosen as the material for the 3D structure?

APPLICATION:

5. How might the findings and outcomes from Byron's project help to influence the creation of other large-scale 3D-printed structures in the future?

ANALYSIS:

6. What are the similarities between large-scale additive manufacturing and the 3D printing you may have done in school? What are the differences?

EVALUATION:

7. What do you think the benefits of 3D printing are?
8. To what extent do you think 3D printing, including large-scale 3D printing, will become an everyday part of our lives in the future?

Activity

Design your own 3D structure:

The Las Vegas Raiders' Al Davis Memorial Torch is a brilliant example of what humans can achieve when they endeavour to do so. From Al's six-decade sporting career to Byron's engineering achievements and the culmination of his team's work, the stadium torch represents passion, commitment and a desire to excel.

Think about:

- Whose life and work would you celebrate if you were a designer or engineer of a large-scale 3D printed structure? What achievements would your structure celebrate? For example, you could choose a sports person, scientist or artist you admire.
- Where would your structure be located? In a sports arena or a specific location in a town or city?
- The Al Davis Memorial Torch is inscribed with a quotation from Al Davis: "The fire that burns the brightest in the Raiders organization is the will to win." What would you inscribe on your structure?
- Safety! What environmental stresses would your structure have to cope with?
- Feasibility. What questions would you have to investigate with your team to ensure your structure will be fit for purpose?

Either with a computer-aided design programme (CAD) or by hand, create an isometric drawing of your design.

Label your drawing with key information about the structure (such as height, weight and estimated number of components needed) as well as any key questions that would need further investigation.

Can you create a digital twin of your design?

If you have access to a 3D printer, can you print a prototype?

More resources

- The National Composites Centre (NCC) (www.nccuk.com) is an independent, open-access technology centre delivering world-class research and development of composites. It is a brilliant resource for anyone interested in engineering and composites, and there is a dedicated section on advanced composites: www.nccuk.com/what-we-do/advanced-composites
- Engineering.com published an article about the Las Vegas Raiders' torch: www.engineering.com/story/nfl-stadium-boasts-the-worlds-largest-3d-printed-structure
- Learn more about digital twins with this article from The Conversation: www.theconversation.com/what-are-digital-twins-a-pair-of-computer-modeling-experts-explain-181829
- To see the impressive Al Davis Memorial Torch in more detail, visit: www.raiders.com/photos/in-detail-revealing-the-completed-al-davis-memorial-torch
- To learn more about Al Davis, visit: www.raiders.com/history/al-davis
- The potential of 3D printing even reaches to building construction. Read the Futurum blog post about 3D houses: www.futurumcareers.com/print-your-own-house
- Smaller-scale 3D printing is equally inspiring. Watch this video on the huge impact 3D printed prosthetics can have on people's live: www.youtube.com/watch?v=C18ijPGEK08