

# Arch 407/507: Advanced Materials in Architecture

Research Seminar  
University of Oregon Portland Campus: Spring 2019  
Variable Credit: 2-4 credits  
Instructor: Quang Truong

Time: Thursdays 1500-1700 (TBC)  
Location: Portland, Oregon: White Stag Building  
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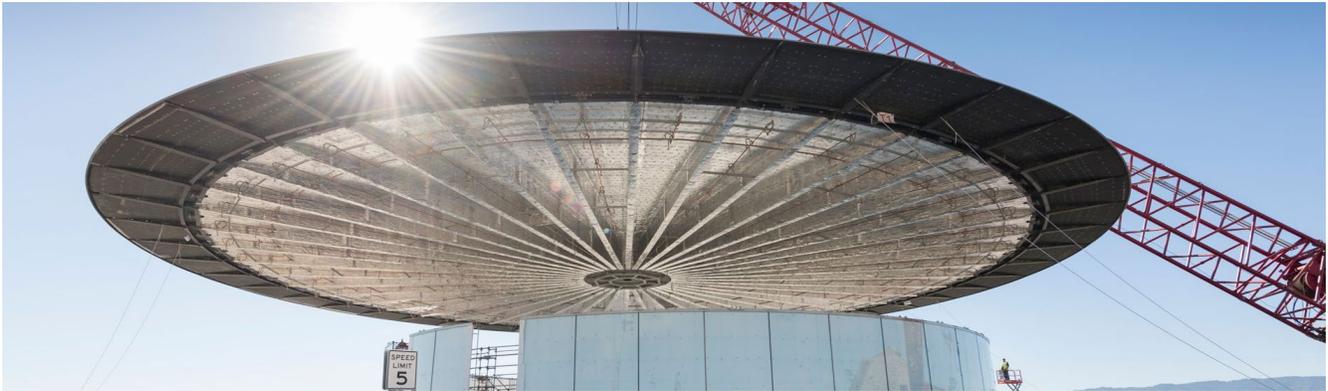


Figure 1: The carbon fiber roof of the Steve Jobs Theater in Cupertino, C.A. (part of the Apple headquarters). Foster + Partners, Architects.

## Course Introduction

This research seminar will explore the issues surrounding the use of advanced or non-conventional materials in architecture: their history, developing technology, issues of sustainability, building code and construction constraints, as well as a survey of completed buildings using these materials.

The future of building will be driven by three considerations: to create better buildings, to build them in a way that takes advantage of technology and computational power, and to do it all more efficiently. In short, to do more with less. A thorough understanding of the science and technology behind materials used in architecture will be one key to this future.

One class of materials that may offer new-found potentials are composite materials, also known as fiber-reinforced polymers, or FRPs. While composite materials such as carbon fiber have made possible incredible advances in industries including automobiles, aerospace, naval architecture, civil architecture, infrastructure, and consumer goods, their use as an architectural material is only starting to be explored. The materials' high strength, light weight, corrosion resistance, and other properties can bring advantages to structure, construction, and sustainability. The processes by which these materials are fabricated and manufactured allow for new expressive shapes and forms at scale which no other material can offer. Furthermore, the engineering principles which govern these materials are unlike traditional building materials, opening a vast spectrum of novel tectonics. Recent buildings by Norman Foster, Herzog & de Meuron, Kengo Kuma, and DS+R utilizing FRPs have changed the perception of what is materially possible in architecture.

This course is intended to introduce students to theoretical and practical issues with material selection in architecture through the close study of one specific class of materials. While this course is primarily focused on FRPs, other non-conventional materials, including mass timber, will be discussed. Research generated in this seminar may be published in a book about advanced materials by Birkhäuser Books in Spring 2020.

## Learning outcomes

By the end of the term, students will have a basic understanding of:

- Current US building code (IBC) defined pathways for material selection in architecture.
- The history of advanced polymer-based materials in architecture;
- Composite material technology and processes and their applications in other non-architectural industries (transportation, aerospace, energy, marine, other);
- Ongoing development of material driven sustainability issues pertaining to architectural materiality in general and composites in specific;

Students will apply this basic understanding towards one of several research-based outcomes to be determined in conjunction with the Instructor, such as a written report, data compendium, conference poster, or series of diagrams and charts, completed either individually or in teams and adjusted per credits taken.