



NCUR 2021 Proceedings

Computational Fluid Dynamics of 3D Printed Tissue

Engineering - Time: Tue 12:30pm-1:30pm - Session Number: 536

Elysa S. Thompson¹ | Department of Mechanical and Energy Engineering, Purdue School of Engineering and Technology, 46202 Computational fluid dynamics (CFD) has the capability to simulate the environment required for biofabricated tissues. Analyzing the forces present on the tissues is essential for the correct development and growth after the scaffold-free biofabricated tissue is 3D printed. The advantage of scaffold-free engineered tissues is the lower rejection rate from the body during integration of the new tissue due to the lack of scaffold or supports needed to fabricate the tissue. The CFD model created by the lab analyzes net flow, pressure distribution, shear stress, and oxygen distribution. These flow characteristics are to be tested to find the flow parameters that best suit the bioreactor. With the use of software such as MATLAB and ANSYS, simulations are done to determine what design constructs are required and flow application is needed for future biofabrication of tissue. Mentor: Andres Tovar, Department of Mechanical and Energy Engineering, Purdue School of Engineering and Technology, IUPUI, 46202

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Evaluating Three Different Histological Subtypes Seen in Pancreatic Adenocarcinoma in Mouse Model

Biology - Time: Mon 3:00pm-4:00pm - Session Number: 2621

Maggie M. Granatir, Melissa L. Fishel, George E. Sandusky, Department of Pathology and Laboratory Medicine, Indiana University School of Medicine, 340 W 10th Street Fairbanks Hall, Indianapolis, IN 46202, Department of Pediatrics and Herman B Wells Center for Pediatric Research, Indiana University School of Medicine, Indianapolis, IN
Maggie Granatir

Pancreatic cancer is the fourth leading cause of death in the United States. In 2019, about 57,000 Americans, slightly more men than women, were diagnosed with pancreatic cancer. In 2019, approximately 45,000 people died of pancreatic cancer. The average life expectancy is around 4-8 months. Cancer cell heterogeneity examines how different tumor cells show distinct morphological and phenotypical changes. This is one of the main motives of tumor aggressiveness, metastatic potential, and resistance to therapy. Differentially tumorigenic cell subtypes have been suggested to lead to pancreatic adenocarcinoma. In this project, 80 pancreatic tumors were evaluated, grown from a pancreatic cell line (Pa02C), and implanted into a genetically engineered mouse (GEM). The pancreatic cell line came from a patient with a metastatic lesion in the liver. The tumors were stained with H&E to evaluate tumor phenotypes and Ki67 to measure cell proliferation. The results indicated 3 different morphological subtypes of cancer cells: ductal, squamous, and mucinous adenocarcinoma. Mucinous adenocarcinoma involved most of the tumor area, and ductal adenocarcinoma had the highest amount of cell proliferation. After reviewing all tumors, it was unusual to find that the primary tumor cells had de-differentiated into mucinous and squamous carcinomas, while only a small area remained as the original tumor.

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The Black and Women's Suffrage Created the Alienation Black Women Face Today

Gender, Ethnicity, & Cultural Studies - Time: Tue 11:00am-12:00pm - Session Number: 419

Timara Turman, Joseph Tucker Edmonds, Africana Studies, IUPUI 420 University Blvd, Indianapolis,

From the drafting of the 15th amendment to modern-day, black women have had issues finding access to a full citizenship in society, especially in the political realm. The 14th amendment granted minorities rights and made them citizens, this began the debating and demand for more freedom. The demand for voting rights began and this created the societal position that black women hold today. The exclusion of black women from male-dominated Black suffrage and women movements caused continuous alienation of the Black woman, which led to the modern-day construction of her intersectional identity. This alienation of Black women and their discrimination caused for her to become an invisible member of society. Although her struggles and discrimination claims are valid, she has continued to be overlooked and dehumanized. In doing so, Black men and white women can feel superior and keep their position on the social dominance ladder. In fact, all three groups face the same basis of discrimination and political struggles, but the Black female voice is often overshadowed by the voice of their Black male and white female peers.

Critical Race Feminism theory will be used to analyze the role the National Council of Negro women played in defining and responding to the alienation around the passage of the 15th amendment . Through the use of scholarly work from Jennifer Eponito, a literary analysis will unveil the need for critical race feminism, and its relation to black women suffrage. Scholarly works will also be used to highlight key moments of alienation from the passage of the 15th amendment until today The National Council of Negro Women's suffrage journey represent the journey of majority of black women. The findings will show that black women's multi-layered identity alienated them from everyone else in society, which forced them to make their own society.

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Mechanical & Industrial Engineering - Time: Tue 5:00pm-6:00pm - Session Number: 5615
Oluwaseun Peter Omole, Asel Habarakada and Dr. Hamid Dalir, Department of Mechanical and Energy Engineering, Indiana University Purdue University Indianapolis, 799 W. Michigan Street Indianapolis, IN 46202-5195
Oluwaseun Omole, Asel Habarakada

For the past few decades, additive manufacturing has exploded in popularity and usability. Its versatility ranges from being used recreationally, to create trinkets and other ornaments, to creating missiles! We at the Advanced Composite Structures Engineering Lab, ACSEL, at IUPUI believe that with the growing use of additive manufacturing (also known as 3-D Printing), more unique and stronger combinations can be created with the addition of more extruders. With a double or even quadruple extruder, we could combine the properties of these materials and evaluate how they affect each other. So we decided to create our own 3-D printer that can handle these capabilities. During this project, the mechanical, electrical, and software of the printer are assembled individually then finally combined together as a fully functioning printer. The mechanical portion of the printer, deals with the physical part of the printer like :the extruders, connections and power supplies. The electrical system mainly deals with the circuit board and its connections. Lastly, the software is all of the code that directs the printer.

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Understanding Mechanical Properties of Honeycomb Structures by Compression Tests

Mechanical & Industrial Engineering - Time: Tue 5:00pm-6:00pm - Session Number: 5611
Jing Zhang, Mechanical and Energy Engineering Purdue School of Engineering and Technology, Indiana University - Purdue University Indianapolis (IUPUI) 723 W Michigan Street, Room SL 260H, Indianapolis, IN 46202-5132
Francisco Rodriguez

The advantages of honeycomb structures compared to others of same volume are that they are lighter, stiffer, and stronger. With time honeycomb structures can be implemented into the way we build

everything around us.

What I would like to accomplish as a research scholar is to push the mechanical structure of the honeycomb figure to its limit by a dynamic compression test more commonly known as The Split Hopkinson Pressure Bar test (SHPB). The article, “Experimental Study on Dynamic Compression Mechanical Properties of Aluminum Honeycomb Structures” performs the SPHB test on a honeycomb structure out of aluminum. I will analyze and investigate their methodology using computer software’s and different materials to make the structure out of. Ideally this will give me a deeper understanding of how honeycomb structures work and how I can apply it to the Mechanical Engineering field.

The way that I will accomplish this is by developing the honeycomb structure on a software called ANSYS. After that I would have 3D printed it and done the SPHB series of stress and strain test manually in a lab, because of Covid-19 I will do most of my research online. This means that I will investigate what softwares I can use to run stress test on and can give me the most data. I will also look into designing the honeycomb structures with different materials (ex. aluminum, plastic, stainless steel, alloy steel, etc.) the reason for this is to re run the stress and strain test on each material. After the data has been collected, I would like to see if the numbers are proportional to the strength of the material or not. The things that I would need will mostly all be found within my computer and this is to try and practice social distancing.

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