Liam J. Fay

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Experience

Stanford University B.S., Product Design '23, M.S., Mechanical Engineering '25

A dynamic Stanford Mechanical Engineering graduate student with a passion for blending engineering with the arts. Specializes in experiential, mechanical, product, and set design. Demonstrates strong leadership and project management capabilities, excelling in cross-disciplinary endeavors and delivering high-quality results. A natural leader with a strong command of both analytical and creative skills and an in-depth understanding of design for manufacturability and assembly.

Stanford Product Realization Lab / Course Assistant

September 2023 - Present, Stanford, CA

Managed, maintained, and improved Stanford University's largest maker space, serving over 1000 students and university affiliates. Hone and teach undergraduate students manufacturing processes including mill, lathe, woodworking, carpentry, 3D printing, and laser cutting. Experienced in dozens of manufacturing processes and materials, including plastics, aluminum, brass and bronze, steel, wood, resin, and more.

Corsair, Inc. / Set Design and Prop Design Intern

June 2023 - September 2023, San Jose, CA

Designed, developed, and built environments for photo and video content for Corsair Inc., a billion-dollar company specializing in computer peripherals using AutoCAD, SOLIDWORKS, Fusion360 as well as woodworking and carpentry tools.

World of Wearable Art / International Finalist

2023 Competition, Wellington, New Zealand

Designed a head-to-toe avant-garde garment for the 2023 World of Wearable Art competition. Combined engineering and costuming skills to design and laser cut leather and thermoplastic sheets as part of the sewn assembly. Entry was selected as an international finalist and displayed on the mainstage of New Zealand's single-largest theatrical production.

Stanford Theatre / Various Technical Roles

September 2019 - June 2023, Stanford, CA Served in various head technical roles - master carpenter, technical director, set designer, technical advisor - for over 15 student and department theatrical productions.

Stanford TAPS Department / Technical Director, the Nitery Theatre

June 2022 - June 2023, Stanford, CA

Directed technical operations for Stanford's Nitery Theatre, ensuring top-notch theatrical experiences. Managed diverse elements including set construction, lighting, sound, and design, emphasizing safety and aesthetic excellence. Collaborated cross-functionally with design and production teams.

Mattel, Inc. / Development Program Management Intern, Games Team

June 2022 - August 2022, El Segundo, CA

Steered board and card game projects from ideation to market launch. Utilized software tools including Agile, Anaplan, Windchill, Cognos, and Workfront for efficient project management, while engaging in design and testing phases. Sent design start programs (DSPs), formatted final product review reports (FPRs); and engaged in game design and testing with product designers.

Stanford IRIS Lab / Engineering Research Intern

June 2021 - August 2021, Stanford, CA

Contributed to the design and documentation of a large-scale moving art installation under the mentorship of Professor Erin MacDonald. Conducted independent study on human perceptions of strength and safety, comparing these insights with evaluations of structures via finite element analyses.

GEM Safety / Lead Hardware Engineer

August 2020 - June 2021, Stanford, CA

Pioneered the design and prototyping of wearable Bluetooth tech for the Mozilla "Fix the Internet" startup incubator, employing advanced SolidWorks CAD techniques.

Stanford Edmark Lab / Design Research Assistant

May 2020 - September 2020, Stanford, CA

Collaborated with Stanford d.school Professor John Edmark to investigate the intricate geometry of 3D shapes, leading to insights into design and functionality. Employed advanced techniques in SolidWorks CAD for precise design and visualization, using laser cutting for tangible model creation. Assisted in both theoretical exploration and hands-on prototyping.

dFab at University of Washington / Technical Documentation Assistant

April 2020 - May 2020, San Diego, CA

Collaborated remotely to document PPE development during a critical pandemic phase, contributing to frontline safety efforts. Worked with an all-remote team to apply 3D printing techniques to mask design.

House of Hints Escape Room / Design Intern

June 2019 - August 2019, San Diego,, CA

Conceptualized and developed immersive escape room experiences, fusing narrative and design elements. Played a pivotal role in crafting "Backstage at the Theater", an immersive escape room adventure, from storyline ideation to gameplay mechanics.

Skills

Software: SolidWorks (CSWA certified), AutoCAD,, MATLAB, Adobe Illustrator, Adobe InDesign, Adobe Premiere, Adobe Photoshop, C++

Skills and Proficiencies: Manufacturing tools, 3D printing, carpentry tools, rapid prototyping, finite element analysis, graphic design

Strengths: Technical writing, set design and construction, presentation skills, iterative design, interpersonal communication, graphic design, project management



Theatrical Work Experience (Design and Production)

Production

Master Carpenter Gaieties 2019 Technical Director Pippin Assistant Producer All the Difference Technical Advisor Gaieties 2021 Technical Advisor Die Fledermaus Technical Director Solstice Party Technical Director Next to Normal Scenic Technician Iulius Caesar Production Mngr

Scenic Technician A Midsummer Night's Dream Scenic Technician Parentheses of Blood Sweeney Todd

Design

Set Designer Set Designer Set Designer Set Designer Makeup Designer Set Designer

Gaieties 2020 Dragfest 2022 **Big Top Drag Circus Celestial Excellence** Les Illuminations Sweeney Todd

Stanford Ram's Head	2019
Stanford Ram's Head	2019-20
Stanford Ram's Head	2020
Stanford Ram's Head	2021
Stanford TAPS Department	2022
Stanford TAPS Department	2022
Stanford Light Opera Company	2022
Stanford Theatre Lab	2022
Stanford AATP	2023
Stanford TAPS Department	2023
Stanford Light Opera Company	2023

Stanford Ram's Head	2020
Stanford Drag Troupe	2022
Stanford Drag Troupe	2022
Stanford Drag Troupe	2022
Stanford TAPS Department	2022
Stanford Light Opera Company	2023

Relevant Coursework

Engineering Fundamentals

CS 106A - Programming Methodology ENGR 14 - Intro to Solid Mechanics MATH 19 - Calculus MATH 20 - Calculus MATH 21 - Calculus MATH 51 - Linear Algebra, Multivariable Calculus MF 80 - Mechanics of Materials

Making and Designing

ENGR 40M - An Intro to Making: What is EE? ME 101 - Visual Thinking ME 102 - Foundations of Product Realization ME 103 - Product Realization: Design and Making ME 104 - Mechanical Systems Design ME 110 - Design Sketching ME 127 - Additive Manufacturing TAPS 42 - Costume Construction TAPS 44 - Hair and Makeup Design TAPS 132 - Costume Design TAPS 133 - Set Design TAPS 232 - Advanced Costume Design

TAPS 233 - Advanced Set Design



Craft & Creation

There's nothing that makes me happier than making. Over my five-year college career, I've immersed myself in the arts and sciences all for the purpose of learning as many crafts and trades as I can. In the following pages, I'm proud to share with you some of my favorite projects that I've completed along the way.

Scenic Design and Carpentry Celestial Excellence Rocket

For Stanford Drag Troupe's 2022 spacethemed winter show, I designed, constructed, and painted this 14-foot-tall psychedelic rocket ship under an independent study with Professor Dan Somen. I modeled the entire assembly in **SOLIDWORKS and fabricated** it in the Stanford Product **Realization Lab and Komm** (a student theater build space).

(4) Curtain

Curtain sewn of voile fabric and attached to frame with staples and screws.

5 Steps

Steps made of 3/4in plywood and 2x4 pine wood.



(1) Frame

Frame made of 2x2 and 2x4 pine wood secured with screws.

(2) Facing

Facing made of laser-cut duron and attached to frame with screws.

(3) <u>Legs</u>

Legs built of laser cut duron fastened with glue and screws.

Processes

Laser cutting, carpentry, sewing, painting, 3D modeling

Materials Plywood, 2x4 and 2x2 pine planks, paint, voile fabric

Role: Scenic Technician Parentheses of Blood

Stanford Theater and Performance Studies Processes: Carpentry, painting

Role: Scenic Technician Julius Caesar

Stanford Theater and Performance Studies Processes: Carpentry

As a TAPS scenic technician, I painted these floor tiles using a combination of layered stencils, then installed them to cover the floor of the Elam Theater.

My work on Julius Caesar involved installing the massive plywood faux-marble panels onto rigging hung from the ceiling.

Role: Technical Director Next to Normal

Asian American Theater Project, 2023 Processes: Carpentry, painting

As the technical director for AATP's Next to Normal, I took a set of designs and turned them into a full scale wooden set that featured a moving staircase, a hanging medicine cabinet, and more than 200 square feet of elevated, weight-bearing platforms at various heights.

Scenic Design and Carpentry **Pippin**

As one of two technical directors for Ram's Head's 2020 Spring musical, Pippin, I set out to create a set piece that would reflect the show's primary design motif of the sun as well as emulate the yearly Burning Man festival from which the show's director was taking inspiration.

With this vision in mind, I designed the centerpiece of the set a 20-foot wide, 10-foot tall modular and climbable rolling platform that features an abstracted sun motif on the front.

The realization of this piece presented many design constraints: I had to take into consideration the ease of movement of such a large piece; to accommodate for that, I prototyped and designed a custom omni-wheel drive system for the two interlocking platforms. I also had to make the steel of the arch as matte as possible so as to not blind the audience with the reflections of the theatrical lights - without using any oils or finishes that could transfer onto the actors' costumes. And I had to create a design that was modular enough to, at different points in the show, represent a green house, a tent, and a cage.

Sadly, Pippin's opening date of April 10th, 2020, meant that the show never saw the light of day due to the COVID-19 pandemic. I'm incredibly proud of the work I was able to accomplish towards its construction, which included machining and dimensioning every piece of steel and beginning on the MIG welded assembly. Even though the show will never see an audience, it empowered me to think big with my designs.



Processes Welding, laser-cutting, carpentry, painting, 3D modeling, metalworking Materials Plywood, 2x4 and 2x2 pine planks, paint, steel tubing

Role: Set Designer Big Top Drag Show

Stanford Drag Troupe, 2022 Processes: Sewing, carpentry, painting

Working with a director's circus-themed vision, I designed and constructed this high-impact minimalist set for the 2022 fall drag show. It featured 960 square feet of custom-sewn curtains and a center platform reminiscent of a circus stage.

> Role: Set Designer Dragfest

Stanford Drag Troupe, 2022 Processes: Carpentry, painting

In addition to directing and performing in Dragfest 2022, I also designed and built a set to match the show's Hollywood-themed aesthetic. The set featured a sleek circular entrance on top of circular steps, a faux-brick backdrop, and led lights around the entrance to frame the performers.

Costume Design and Construction Emerald Ball Gown

I designed and sewed this emerald green ball gown for Stanford Drag Troupe's 2022 fall show. I drafted the pattern for this gown in SOLIDWORKS, wanting to experiment with computer aided design and modeling for sewing.



Pattern

Pattern drafted in SOLIDWORKS, then modified in Adobe Illustrator incorporating findings from muslin prototypes.

Bodice

Bodice pieces were laser-cut then sewn together. Straps were constructed with pleated satin, horsehair braid, and canvas, to create structure and support.

Skirt

To achieve dramatic fullness, 8 yards of satin were sewn into a circle-and-a-half skirt then attached to the bodice. The skirt was reinforced with a hoop skirt.

Processes

Sewing, pattern drafting, SOLIDWORKS, pleating, lasercutting

Materials

Rigilene, polyester satin, canvas, zipper, horsehair braid

Costume Design and Construction Butterfly Wings and Corset

In the fall of 2021, I designed and constructed an elaborate costume for that year's Gaieties musical production. Though I was not the costume designer for the show, I had taken on the creation of the costume for my character, the Regal Butterfly, a vibrant and dazzling creature living in an Alice in Wonderland-inspired version of Stanford. I took inspiration from the design of Tim Burton's Mad Hatter as well as various depictions of butterflies in fantasy properties. I generated a series of possible designs, showed them to the costume designer, and





got to work creating the one they chose.

The design featured large butterfly wings and an insectinspired corset that evoked an insectile abdomen. I created the corset first, grading and truing a similar pattern I had used before. The pattern featured 12 separate panels, which required me to be very precise with the construction. With 12 different seams, an error of just 1/4" per seam could compound to a garment that was too big or too small by as much as 3" - a massive amount in costuming. I used canvas fabric to create a strong backing for the costume and ran long zip-ties through a series of channels to give it structure and rigidity. I then added grommets to the back of the corset to allow lace to fasten it all in place.

I sketched the wings in Solidworks then sliced them into pieces I could fit on Room 36's Laser Cutters. I cut the pieces - 16 in all - out of foam core and attached them with tape and hot glue, reinforced with zip ties laid flat for strength that would still allow the wings to flex. I then covered the wings in layers of strips of five colors of satin fabric, aligning their grains with the way I wanted them to reflect stage light. I backed the wings with a purple vinyl to add strength and

visual appeal. I then laser cut a backpacklike harness out of Duron to hold the wing pieces together and attach them to the corset.

This costume is one of my favorites I've created. It has a literal wingspan of 8' and was my first foray into using unconventional materials and techniques in costume construction.



Costume Design and Construction Spotlight: Liquid Gold

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As part of a team, I entered the 2023 World of Wearable Art contest in "Gold" category. The costume was constructed over the course of a month. As this is a collaborative project, I have indicated my involvement in each component in pink subheadings.

Corset Shell

Lead Designer Laser-cut Worbla (a costuming thermoplastic) were heat-formed in the front and back around the bodice then covered in gold silicone.

2 Bee Broach

Lead Designer

Layers of Worbla were formed around a 3D printed mold then painted gold.

Honeycombed Shoes Lead Designer

Off-the-rack shoes were wrapped with honeycomb-patterned pleather, then painted gold and covered in gold silicone drips.

Processes

Laser cutting, draping, 3D printing, sewing, silicone forming, heat forming

Frilled Collar Contributor

Layers of organza were adhered to Worbla sheets and attached with wire and painted elastic. Hexagons were cut out and soldered clean and goldresin-coated bees were attached.

G Corset Contributor

 (\mathbf{A})

Corset was sewn of organza and polyester and reinforced with spiral steel and flat steel boning.

6 Honey Drips Contributor

Layers of silicone and hot glue were draped on the garment to form a honeylike overskirt.

Beehive Skirt Contributor

Ten yards of organza and polyester lining were bonded together then smocked in a honeycomb pattern and reinforced with an underskirt.

Materials

Worbla, organza, polyester lining, pleather, resin, bees, millinery wire, elastic, gold paint, hot glue (molded), spiral steel boning, flat steel boning, grommets



Craft and Creation Graphic Design



2017 Infographic Report LGBTQ+ of FIRST



Company Poster Stanford Music Department



2016-2017 Annual Report **Teach for America San Diego**



DRAGFEST Poster **Stanford Drag Troupe**



Celestial Excellence Poster Stanford Drag Troupe





with DeJa Skye and Bosco from RuPaul's Drag Race Season 14

SEXUAL ORIENTATION

PANSEXUA

STRAIGH

TEAM ROLE

FABRICATION

OUTREACH

SCOUTING 36.8%

SOFTWARE 26.5% Spirit 19.1%

ot of the LGBTQ-

ROBOT DESIGN

SAFETY

WEBSITE

43.4% 27.9% 28.7%

39.7% MEDIA 27.9%

43.4%

52.2%

16.2%

24.3%

12.5%

31.6% 16.9% LESBIAN

41.1% BISEXUAL

21.3%

5.9%

8.8% 2.2% DEMISEXUAL

SOCIAL

Stanford Drag Troupe Latke = Cicala = 28 Daze = Chaos X Machina of the Rock Johnson = ZZ Chic = St. Andrew = Amy Blue Daphne Summers = Zubaru = Rashi = James Bondage





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Stanford Drag Troupe Presents

MUSIC AND LYRICS BY STEPHEN SONDHEIM BOOK BY GEORGE FURTH

DINKELSPIEL AUDITORIUM 7:30 THURSDAY, JAN 26 7:30 FRIDAY, JAN 27 7:30 SATURDAY, JAN 28 2:30 SUNDAY, JAN 29

TICKETS FREE AT DOOR WITH SUID



Makeup and Costume Design Floral Tea Dress Personal Project

Makeup Design Old Age Makeup TAPS 42: Makeup Design Makeup Design Moments Stanford Drag Troupe

Craft and Creation Hair and Makeup

I love creating in every way. I've studied makeup and hair design both in and out of the classroom and consider it an integral part of my skillset as a maker and a creative.

Hair Design Midsummer Night's Dream TAPS 44: Wigs & Hair Hair Design Bring It On TAPS 44: Wigs & Hair

oph. Deniz

Hair Design Mustache Project TAPS 44: Wigs & Hair Hair Design Victory Rolls TAPS 44: Wigs & Hair

Product Realization Royal Gem

For ME103 - Product Realization: Design and Making, I created a makeup compact that evoked the elegance and sophistication of old Hollywood. I began my prototyping process in SolidWorks, creating a CAD model of the final product. Through a series of iterations, I arrived at the final design: an extruded octagon, with beveled sides reminiscent of a cut gem. I machined ROYAL GEM out of 360 Brass on a Bridgeport vertical mill, finishing the surface with various grits of sandpaper and a polishing wheel. I formulated a duochrome gold and white highlighter with micas and a dimethicone base, then pressed the powder into the compact using a custom, 3D-printed mold and an arbor press.





Processes

3D modeling, rapid prototyping, milling (rotary, vertical), polishing, press fitting, 3D printing

Materials 360 brass, magnets, cosmetics pan, mica, dimethicone

Product Realization Makeup Compacts

After making a makeup compact in ME 103 out of brass, I wanted to figure out how real, mass-manufactured compacts came together. With the aid of an exacto knife and a hot 3D print bed to melt packaging adhesives, I took apart some old palettes I had and reverse engineered their structure. I then designed, prototyped, cut, and assembled new, custom palettes made out of premium wrapping paper, magnets, chipboard, and cosmetics pans. I'm proud to say that the resulting products are indistinguishable from mass-manufactured products of a similar nature.

Processes

3D and 2D modeling, laser cutting, rapid prototyping

Materials

PVA glue, chipboard, magnets, cosmetics pans, premium wrapping paper





Product Realization Roman Sawmill

For a CLASSICS 168 final project, I decided to create a working model of the Hierapolis Sawmill, one of the world's earliest known mechanical mills. As the real Hierapolis Sawmill is in ruins today, I had to reverse engineer the mechanics behind the sawmill from a stone carving of the machine. From this carving and other historians' interpretations of it, I created a working sawmill our of laser-cut wood and 3D printed PLA. I decorated it with pine trees that would be native to the region of Anatolia.

Processes 3D printing, laser cutting, 3D modeling

Materials 1/8" birch, PLA, dowels

Product Realization Busy Bee Geneva Drive

I designed a geneva drive mechanism for my final ME 102 project. Geneva drives are interesting - they translate continuous rotational movement into intermittent rotary motion. The design of these mecanisms is governed by strict geometric properties, so I defined all of the necessary dimensions as variable in SOLIDWORKS so that I could easily change them relative to eachother.

<u>Σ</u> Ø3.34

Name	Value / Equation	Evaluates to	Comments	^	OK
- Global Variables					
"a"	= 2in	2in	drive crank radius		Cano
"n"	= 4	4	driven slot quantity		
"p"	= .1875in	0.1875in	drive pin diameter		Impo
"t"	= .05in	0.05in	allowed clearance		
"c"	= "a" / sin (180 / "n")	2.82843	center distance		Expo
"b"	= ("c" ^ 2 - "a" ^ 2) ^ 0.5	2in	Geneva wheel radius		Expo
"s"	= "a" + "b" - "c"	1.17157in	slot center length		
"w"	= "p" + "t"	0.2375in	slot width		Hel
"y"	= "a" - ("p" * 1.5)	1.71875in	stop arc radius		
"Z"	= "y" - "t"	1.66875in	stop disc radius		
"v"	= "b" * "z" / "a"	1.66875in	clearance arc	_	
Add alobal variable				~	

Processes Laser cutting, gluing, 3D and 2D modeling Materials 1/4" birch plywood, dowels

Additive Manufacturing Wig Holder

For my final project, I wanted to continue on my theme of dorm room storage solutions.

The user and use case are pretty specific: someone who has a lot of wigs, not a lot of storage, and a large amount of cork board on their wall. From these needs, I created a wall fixture that can mount a styrofoam wig head to a cork board with just T-pins.

I began my exploration by defining the width of the wig head, the width and length of the pins, and the ideal insertion angle of the T-pins.

I used shape optimization to generate a printable shape. After rounds of refinement, I ended up with a part that could successfully mount to a corkboard wall with just T-pins.

I'm very happy with how my project turned out. It easily holds the weight it needs to and looks really cool on my wall. I plan to print many more of them to continue to optimize storage in my dorm room.









Liam J. Fay Portfolio - 16