ENGINEERING PORTFOLIO

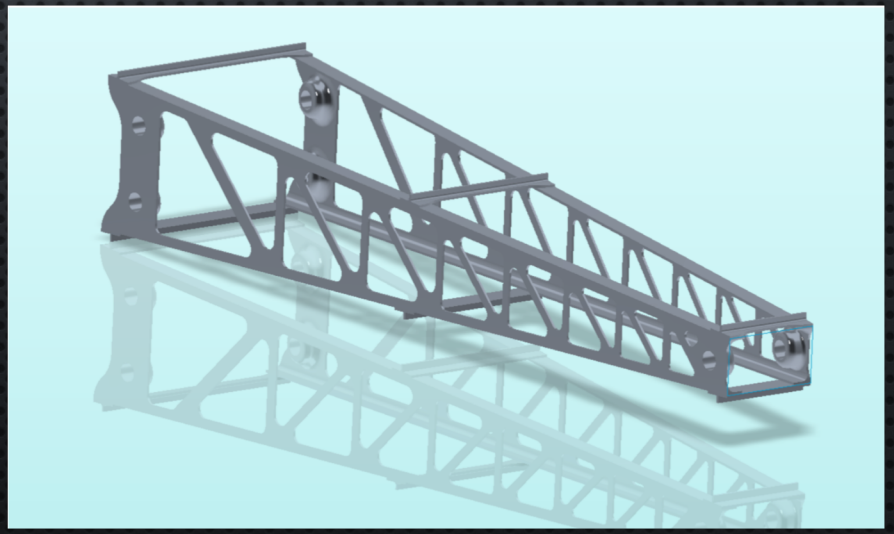
Ofek Peres

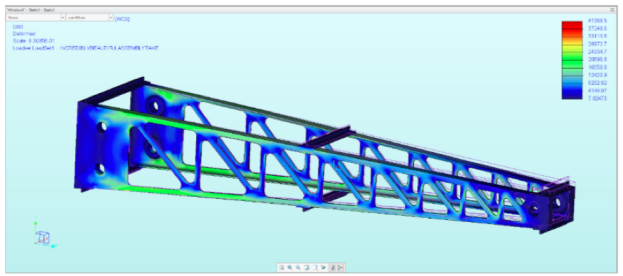
Princeton University

Mechanical and Aerospace Engineering

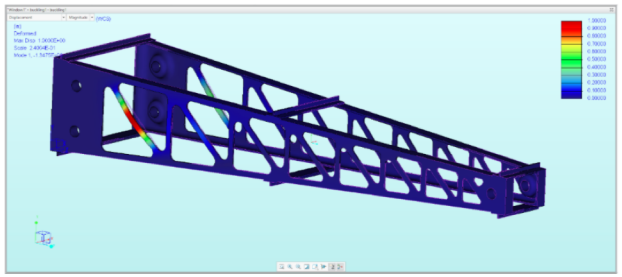
ENGINEERING CRANE DESIGN COMPETITION - 1ST PLACE WINNER

- DESIGNED AND MODELED WITH CAD, CNC, BUILT, ASSEMBLED AND TESTED A LIGHTWEIGHT STRUCTURE TO HOLD 325 POUNDS THAT WEIGHED 1.06 POUNDS
- EARNED FIRST PLACE IN THE DESIGN COMPETITION FOR LIGHTEST CRANE TO SUPPORT THE REQUIRED WEIGHT
- EARNED AN A+ IN ENGINEERING DESIGN



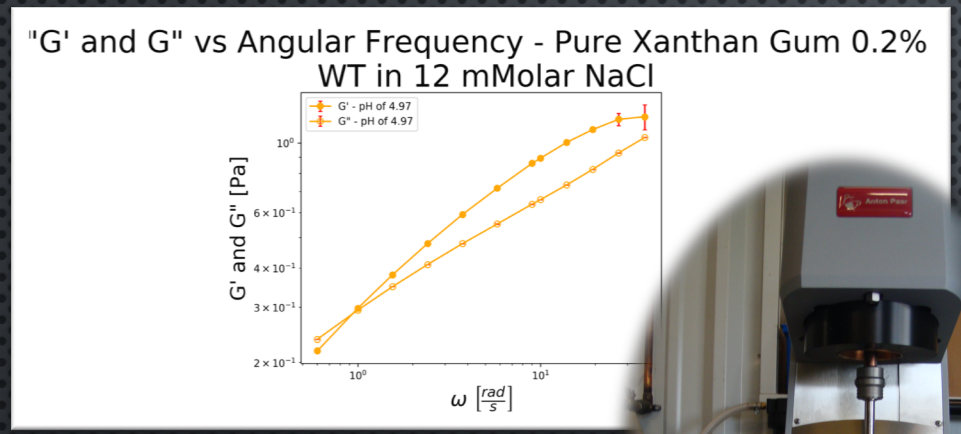


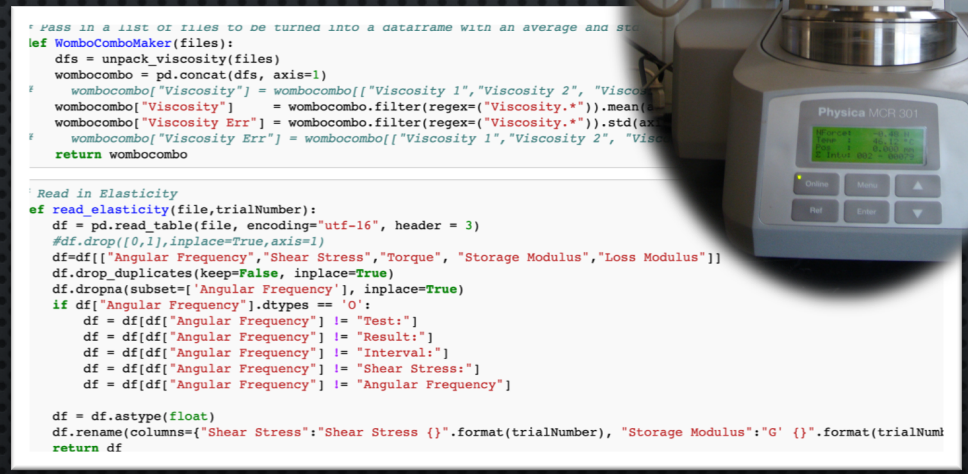
(a) Stresses in the second design with trusses



(b) Buckles in the second design with trusses

COMPLEX FLUIDS GROUP





```
# Pass in a list of files to be turned into a dataframe with an average and st
def WomboComboMaker(files):
    dfs = unpack_viscosity(files)
    wombocombo = pd.concat(dfs, axis=1)
    #wombocombo["Viscosity"] = wombocombo[["Viscosity 1","Viscosity 2", "Visco
    wombocombo["Viscosity"]     = wombocombo.filter(regex=("Viscosity.*")).mean(a
    wombocombo["Viscosity Err"] = wombocombo.filter(regex=("Viscosity.*")).std(ax
    #wombocombo["Viscosity Err"] = wombocombo[["Viscosity 1","Viscosity 2", "Visc
    return wombocombo
```

```
# Read in Elasticity
def read_elasticity(file,trialNumber):
    df = pd.read_table(file, encoding="utf-16", header = 3)
    #df.drop([0,1],inplace=True,axis=1)
    df=df[["Angular Frequency","Shear Stress","Torque", "Storage Modulus","Loss Modulus"]]
    df.drop_duplicates(keep=False, inplace=True)
    df.dropna(subset=['Angular Frequency'], inplace=True)
    if df["Angular Frequency"].dtypes == 'O':
        df = df[df["Angular Frequency"] != "Test:"]
        df = df[df["Angular Frequency"] != "Result:"]
        df = df[df["Angular Frequency"] != "Interval:"]
        df = df[df["Angular Frequency"] != "Shear Stress:"]
        df = df[df["Angular Frequency"] != "Angular Frequency"]

    df = df.astype(float)
    df.rename(columns={"Shear Stress":"Shear Stress {}".format(trialNumber), "Storage Modulus":"G' {}".format(trialNumb
    return df
```

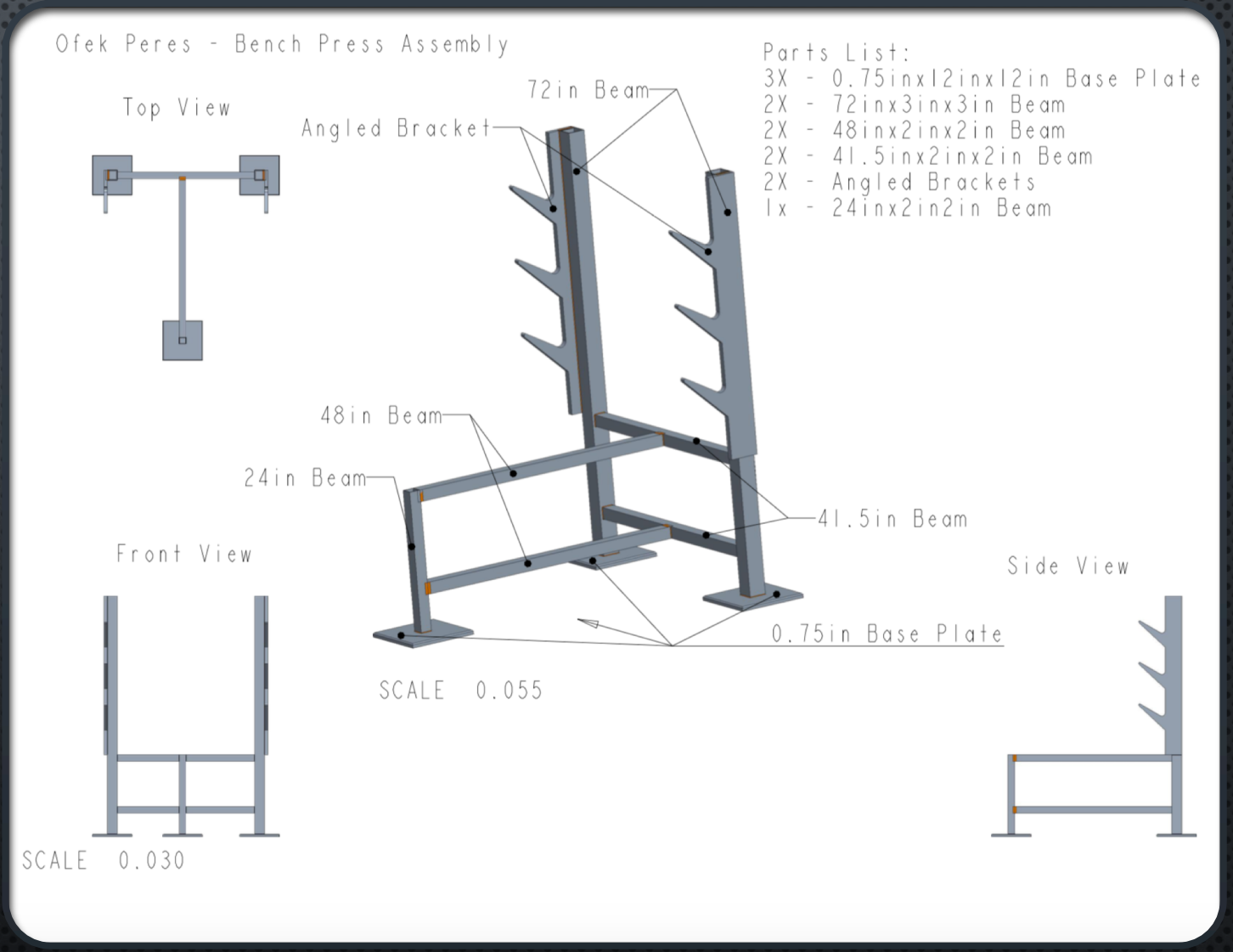
STUDIED DYNAMICAL AND MECHANICAL PROPERTIES OF POLYELECTROLYTE SOLUTIONS, SUCH AS SHEAR VISCOSITY AND VISCOUS AND ELASTIC MODULI, AS A FUNCTION OF SALT TYPE AND CONCENTRATION

GATHERED REPRODUCIBLE DATA WITH THE ANTON PAAR 301 RHEOMETER

UTILIZED THE PANDAS, NUMPY, GLOB AND MATPLOTLIB PYTHON PACKAGES TO SCRUB DATA AND GENERATE ANALYTICS

OLYMPIC BENCH PRESS

- Designed and modeled with CAD a viable Olympic Bench Press that held a 500-pound weight and deflected less than 1/1000 inch
- Simulated in CREO using Finite Element Analysis to identify stress concentrations and identify weak-points. Found the center of mass to ensure no tipping under load.
- Generated Engineering Drawings of all component parts as well as the final assembly with welds.
- The model synthesized numerous design considerations including cost, strength, safety, reliability, user comfort and ease of manufacturing.

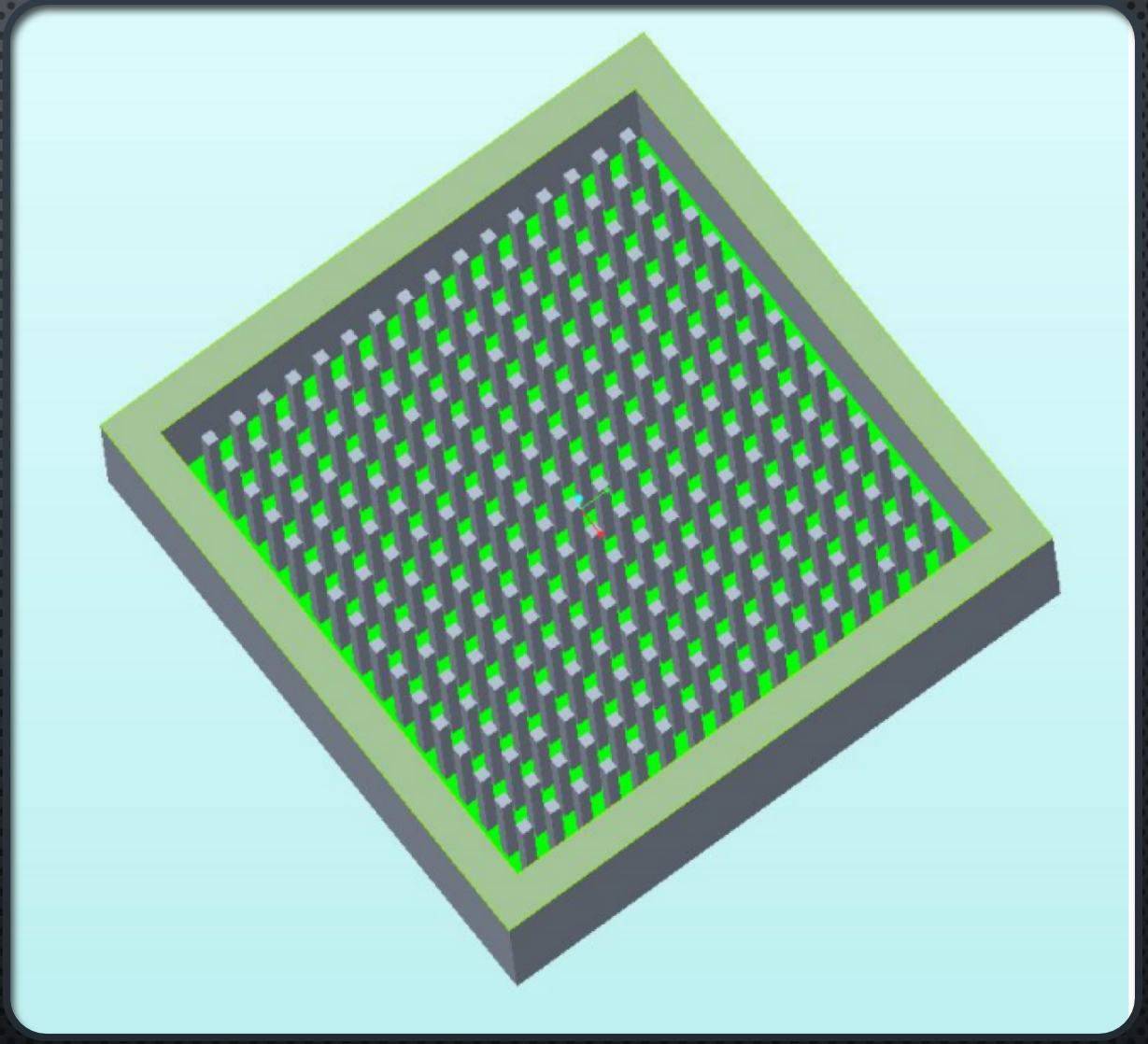


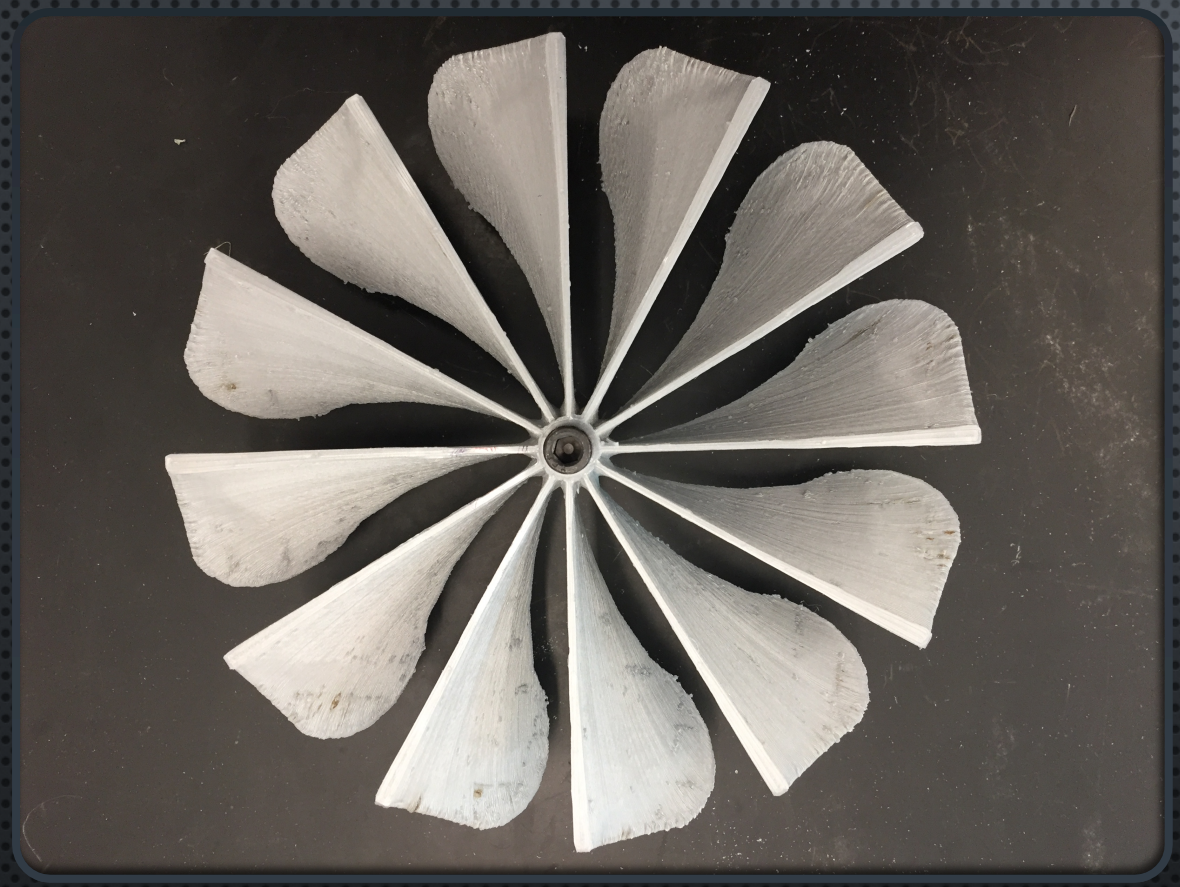
INVERTED PENDULUM STABILIZATION

- Designed an Observer based Feedback System to Stabilize an Inverted Pendulum utilizing MATLAB and Simulink
- Utilized Linear Quadratic Feedback (LQR)

HEATSINK DESIGN

- Designed a 4x4x1 inch heat sink composed of aluminum 6061 to maximize surface area for cooling/Heat Dispersion
- Built to minimize usage of coolant
- Modeled/Simulated with CAD/FEA
- Manufactured using CNC Mill





WIND TURBINE DESIGN

- Built a model wind turbine 15cm in diameter designed to extract energy from a 20 m/s air flow to be transferred to an electric generator with the highest possible coefficient of power
- Utilized sequential iterations that were designed and simulated on Qblade, assembled in Creo Parametric, 3D printed on Ultimaker printers, and tested in a subsonic wind tunnel
- Recorded voltage and rotational frequency values. Each design performed better than the previous, achieving maximum coefficients of power of 0.06, 0.11, and finally 0.13 at Tip Speed Ratios between 0.5 to 0.7