

TAMU REVEILLE's DREAMS RIG



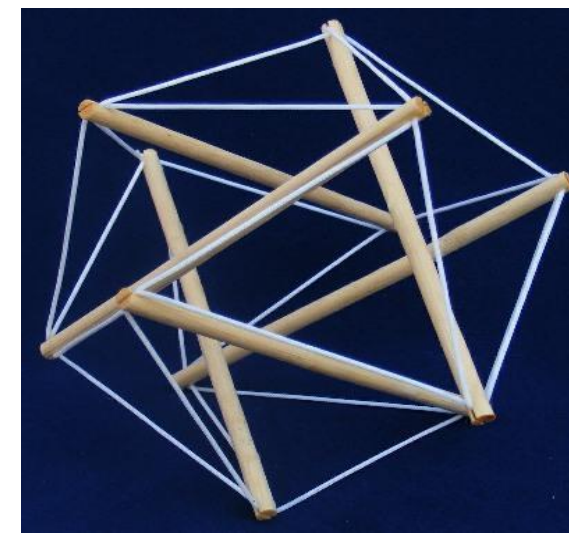
“DRilling and Extraction AutoMated System”

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Tensegrity

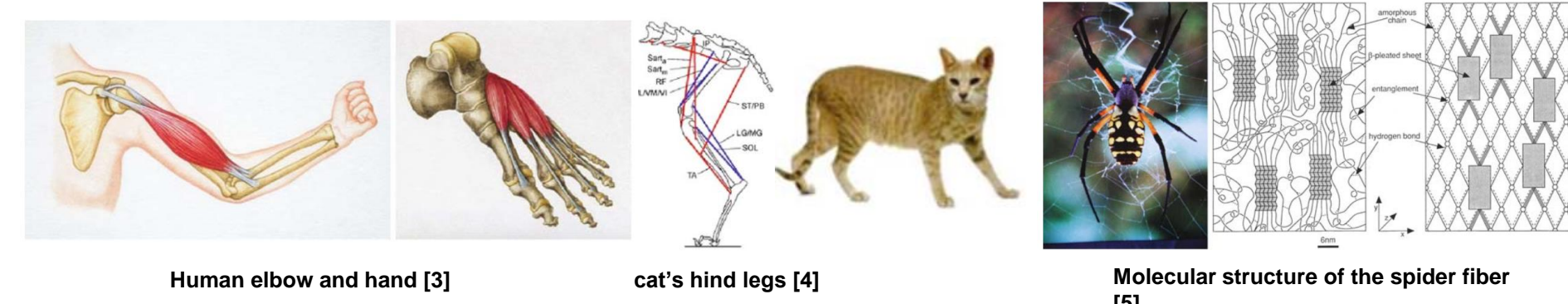
What is a tensegrity Structure?

Stable network of compressive members (bars/struts) and tensile members (strings/cables)

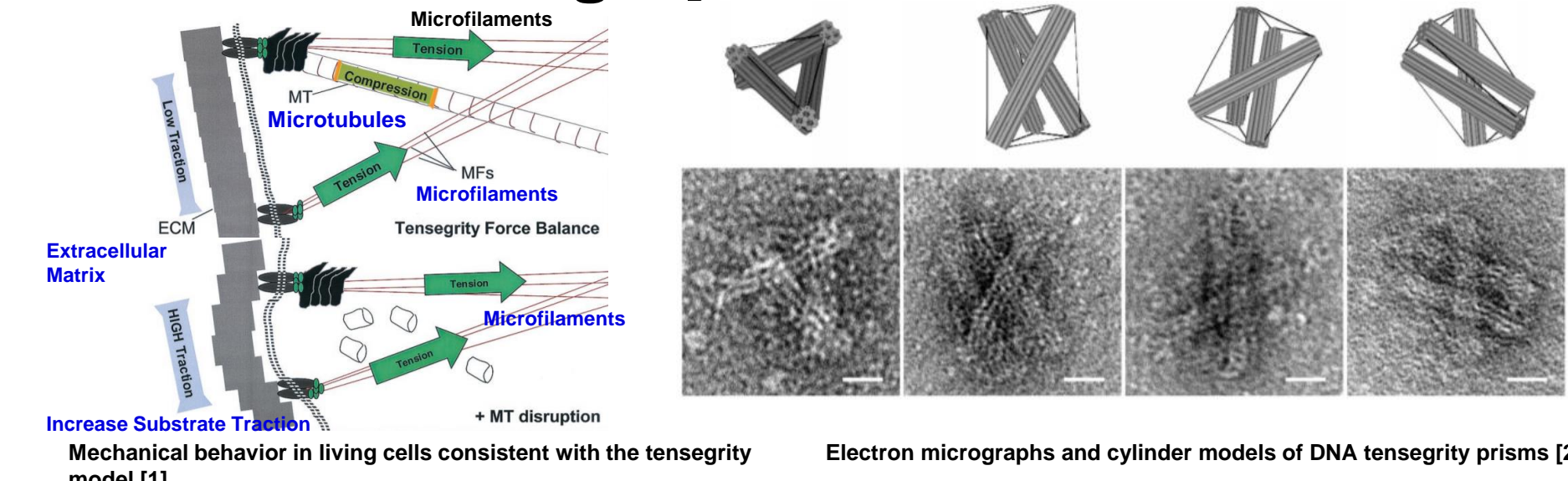


Nature take on Tensegrity: Micro/Macro-scale

Efficient weightlifting & control, no motors!



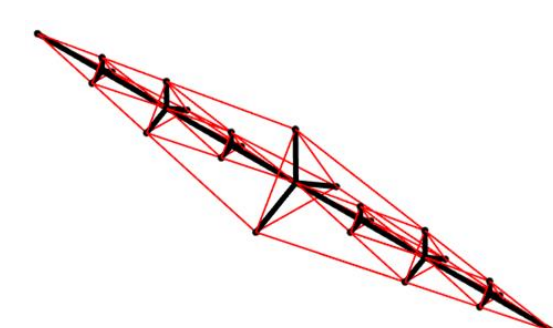
Nature take on Tensegrity: Nano-scale



Advantages of Tensegrity

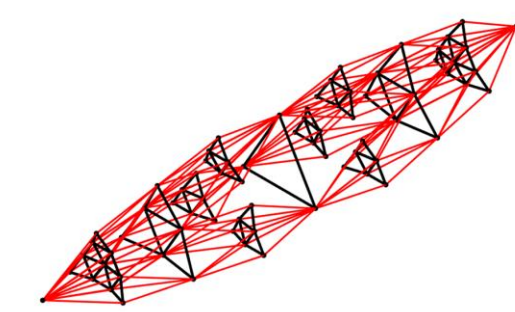
Mass Efficiency

- All the one-dimensional structural members are axially loaded. The material is only needed in the essential load path, not the orthogonal one.



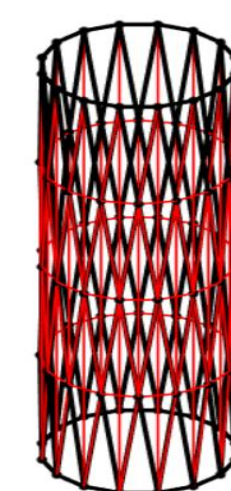
Actuate Model

- No material bending, the deformation is only one dimensional, force density is in one direction.



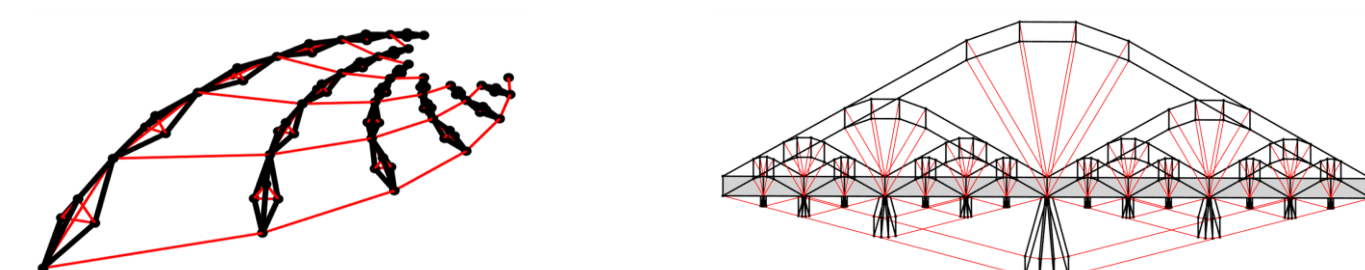
Energy Absorption

- The strings and soft structure can be used for energy absorption.



Shape Control

- Change the length of strings to achieve large shape morphing.



Integrated system

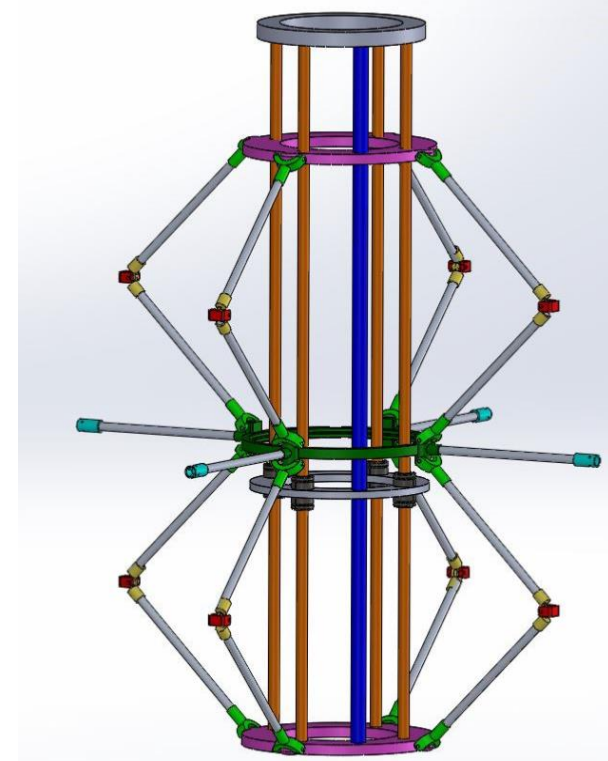
The integrated system is to be composed of the following:

- Derrick
- Rotary System
- Circulation system
- Water filtration & extraction
- Electronic & Hardware



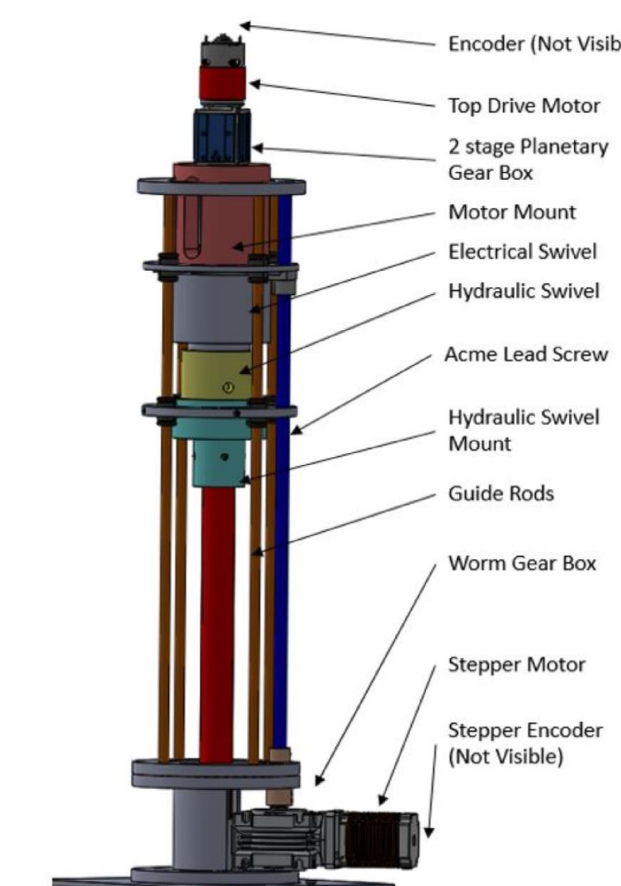
The rig Derrick, comprising the tensegrity Skeleton depicted on the right is made of:

- Ring Joint (green)
- ACME Rod (blue)
- Stability Rods (orange)
- Class 2 Joint (yellow)
- C-joint (red)
- Class 1 Joint (aqua)



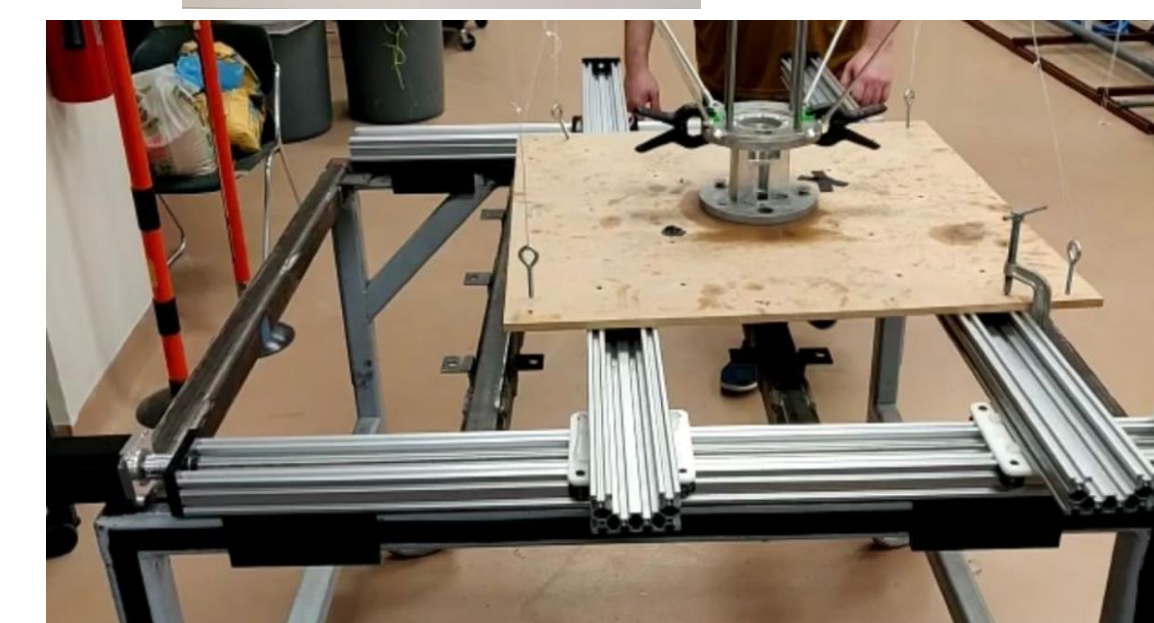
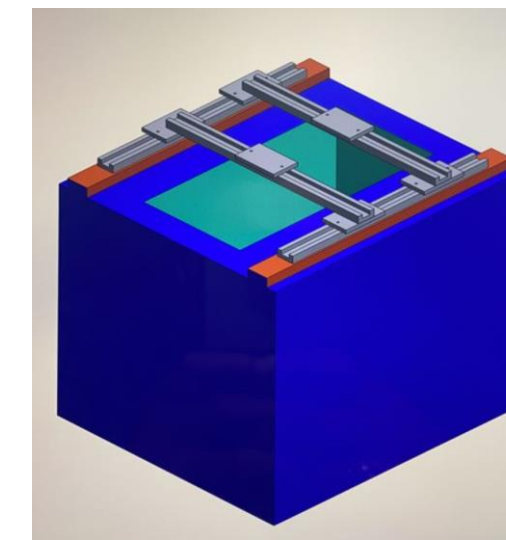
The rotary system to be fully integrated carries the:

- Rotary motor
- Gearbox
- Stepper motor
- ACME rod
- Electric & Hydraulic Swivel
- Casing
- Drill string



Mounting Structure

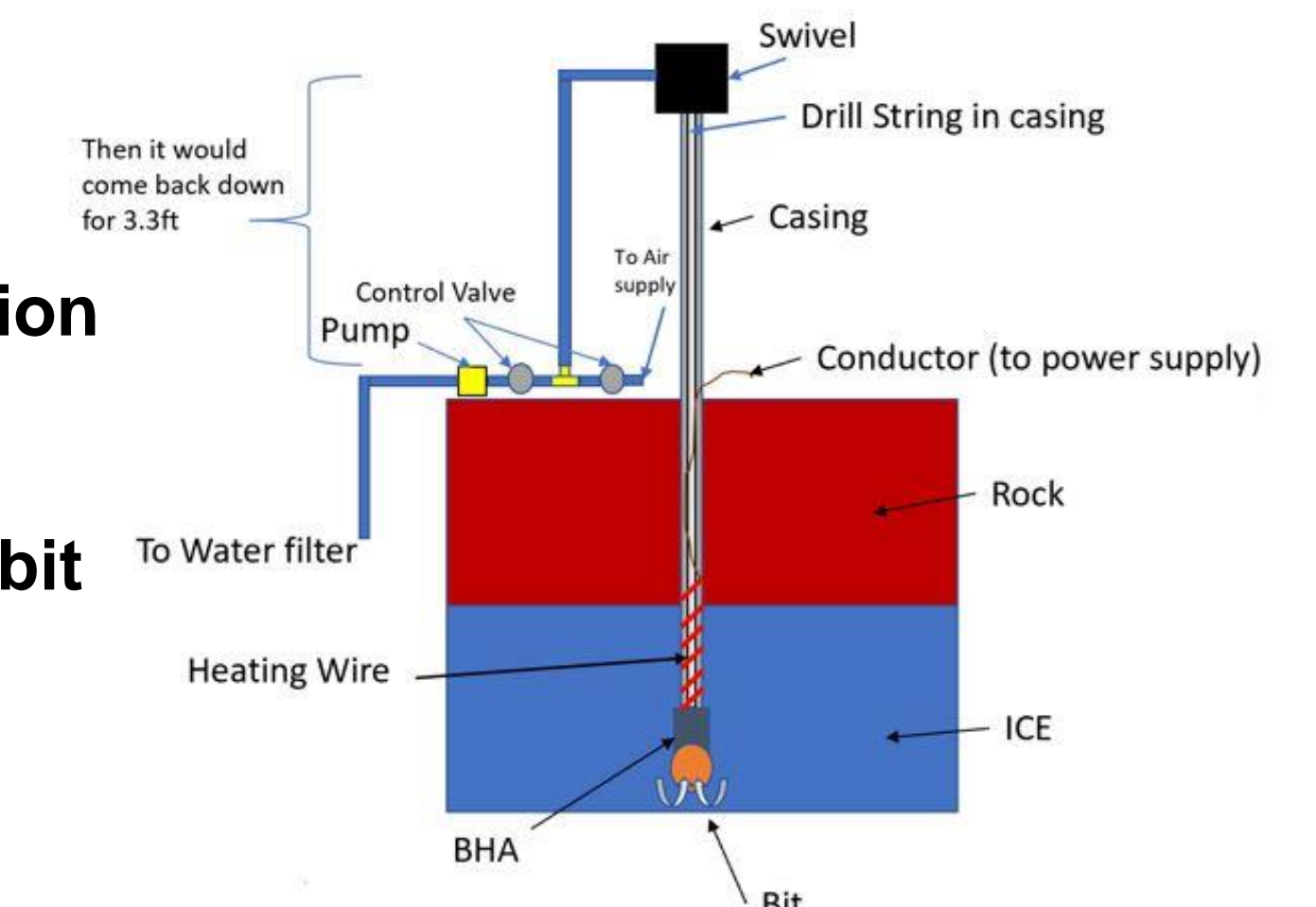
- Aluminum railing system: enables the tensegrity structure to move in the X-Y direction.
- Powered by two stepper motors.
- The system consists of six carts, 4 in the X-direction and 2 in the Y-direction.
- The tensegrity structure is bolted to the carts for stability.



Water Filtration & Extraction

A 3 IN 1 extraction system allows us to autonomously perform all operations with the least amount of direct interaction needed

A miniature 'PDC' model drill bit is attached to a drill-string ran through the whole to perform drilling operations



The drill-string is ran through a multi-purpose casing which will provide the necessary heat to melt the ice



The drill-string system is used in reverse to produce the melted via the drill bit at the bottom and a peristaltic pump on top

Control System and Electronics

The control system used to operate our system is made of the following:

- An Inertial measurement unit (IMU) sensor to record triaxial acceleration and triaxial angular velocity
- A temperature sensor to monitor downhole temperature
- A Top drive motor that provides rotational motion
- A stepper motor for vertical motion
- A Slip Ring and two Arduino Dues for Data collection