

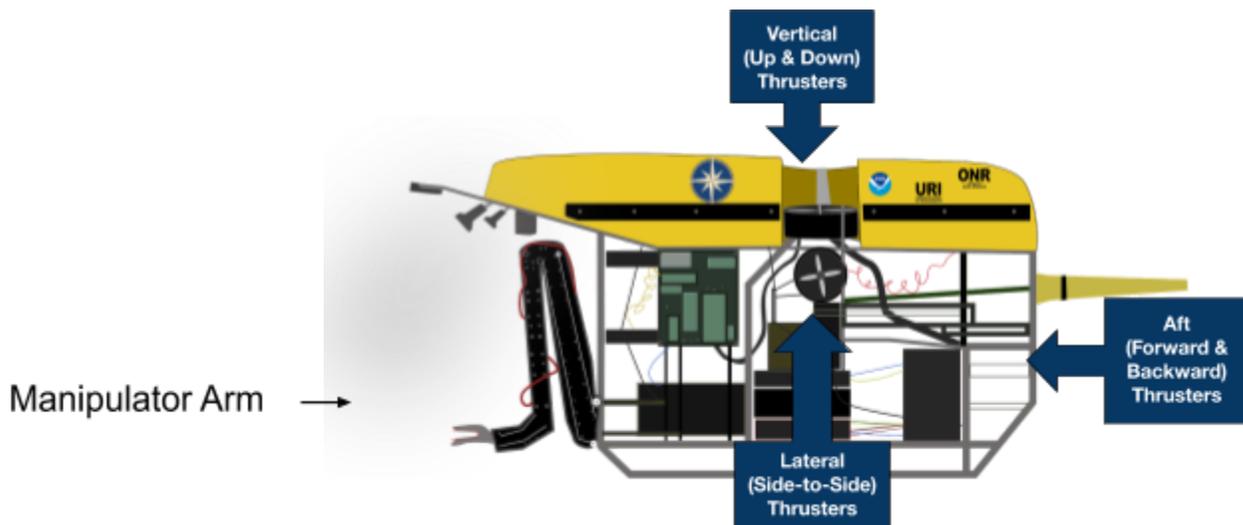


### HYDRAULIC ROBOT ARM ACTIVITY

#### THE BASICS

**Hydraulics** (from Greek *hydor* for water and *aulos* meaning pipe) is a term used to describe the branch of science and technology concerned with the passage of fluids through pipes and channels, especially as a source of mechanical force or control. Hydraulic machines are used in many applications across the world, and are even at use inside the human body (ex: your heart)! From cranes to groundwater wells to automobile brakes and oceanographic robots, the fluid provides an essential source of power.

On Exploration Vessel (E/V) *Nautilus*, remotely operated vehicle (ROV) *Hercules* (pictured below) relies on a hydraulic pump to activate its two manipulator arms. In this activity, you will build a small-scale hydraulic robot arm to move blocks and witness this fluid dynamic system in action.



#### GOALS

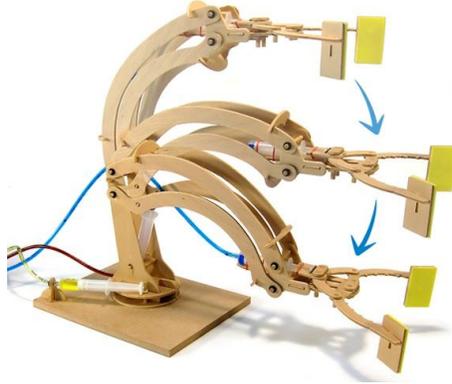
- Visualize hydraulics in action by operating small-scale assembled robotic arms.
- Learn the fundamentals of hydraulic machines and how this technology is used in Remotely Operated Vehicle *Hercules*.
- Test your robot arm navigation skills by completing a timed materials collection challenge.



### MATERIALS

Each group (3 people) will need the following:

- 1 Pathfinders [Robotic Arm](#) Kit either pre-assembled or groups can build together!



- Assorted objects to function as samples - thread bobbins, wooden blocks, floral foam or small toys all work well
- Small bowl to act as the sample bin for collected assorted objects
- A timer

### TEST YOUR ROBOT SKILLS

1. Form a team of 3 ROV pilots. Each person will control the syringe to move one joint.
2. Gently push and pull the syringe to move one aspect of the manipulator. Do NOT pull the plunger past the red line. Once air gets introduced to hydraulic lines, arms will lose range of motion and lifting power.
3. Work together as a team to pick up all samples and place them into the sample bin.
4. Time your team and record here: \_\_\_\_\_.

*\*\*Instructor option: Set up a centrally located "ROV Pilot Hall of Fame" poster for groups to add their names & times.*

### THINK ABOUT IT!

ROV *Hercules* uses two manipulator arms. One arm has 7 joints that enable complex movement during exploration such as sampling rocks or biota, holding sensor equipment, placing samples into canisters on the ROV frame. How many joints does your robot arm have?