



Junior Solar Sprint Car Building Workshop

**FAST Conference
Tampa, FL
October 19, 2023**

Presented by:
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What is Junior Solar Sprint (JSS)?

- ❖ National program developed in 1990 by the Dept. of Energy
- ❖ Started with middle school students
- ❖ Hands-on engineering activity that highlights solar (photovoltaic) technology



Why Junior Solar Sprint?

- ❖ Exciting engineering challenge
- ❖ Requires problem-solving and creative thinking
- ❖ Encourages teamwork
- ❖ Applies STEAM skills
- ❖ Focuses on learning by doing



JSS Opportunities

- ❖ FSEC – EnergyWhiz, EnergyWhiz Expos & Partner Programs (STEM Saturday, Innovation Games)
- ❖ AEOP – Army Educational Outreach Programs
- ❖ TSA – Technology Student Association (get a free JSS kit by registering on their website)
- ❖ Other States – Colorado (NREL), Texas, California
- ❖ SECME

AEOP

Marywood Summer Flash
Atlanta, Georgia



TECHNOLOGY STUDENT ASSOCIATION



JSS Objectives

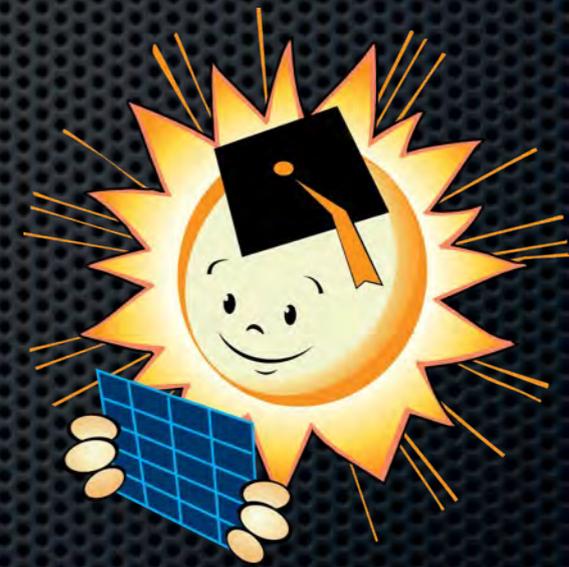
Student(s) will:

- ❖ Design and build a solar-powered vehicle using a regulation photovoltaic panel and motor
- ❖ Document the design and building process
- ❖ Demonstrate that the vehicle performs



Junior Solar Sprint 2023

JSS at EnergyWhiz - In-person race
April 20, 2024 at FSEC in Cocoa



JSS Project Info & Webpages Due
April 3, 2024

JSS Race at EnergyWhiz

Vehicle must be designed, built and raced by a team of 2 - 4 students ONLY and will:

- Include an unmodified 'sanctioned' photovoltaic (PV) panel & motor
- Compete on a 20 meter track
- Include an eyelet for the monofilament line/guidewire
- Be able to carry a "passenger/payload" represented by a table tennis ball (ping-pong ball)

JSS (In-person) at EnergyWhiz

Web Page

Must be submitted by the April 3, deadline and include:

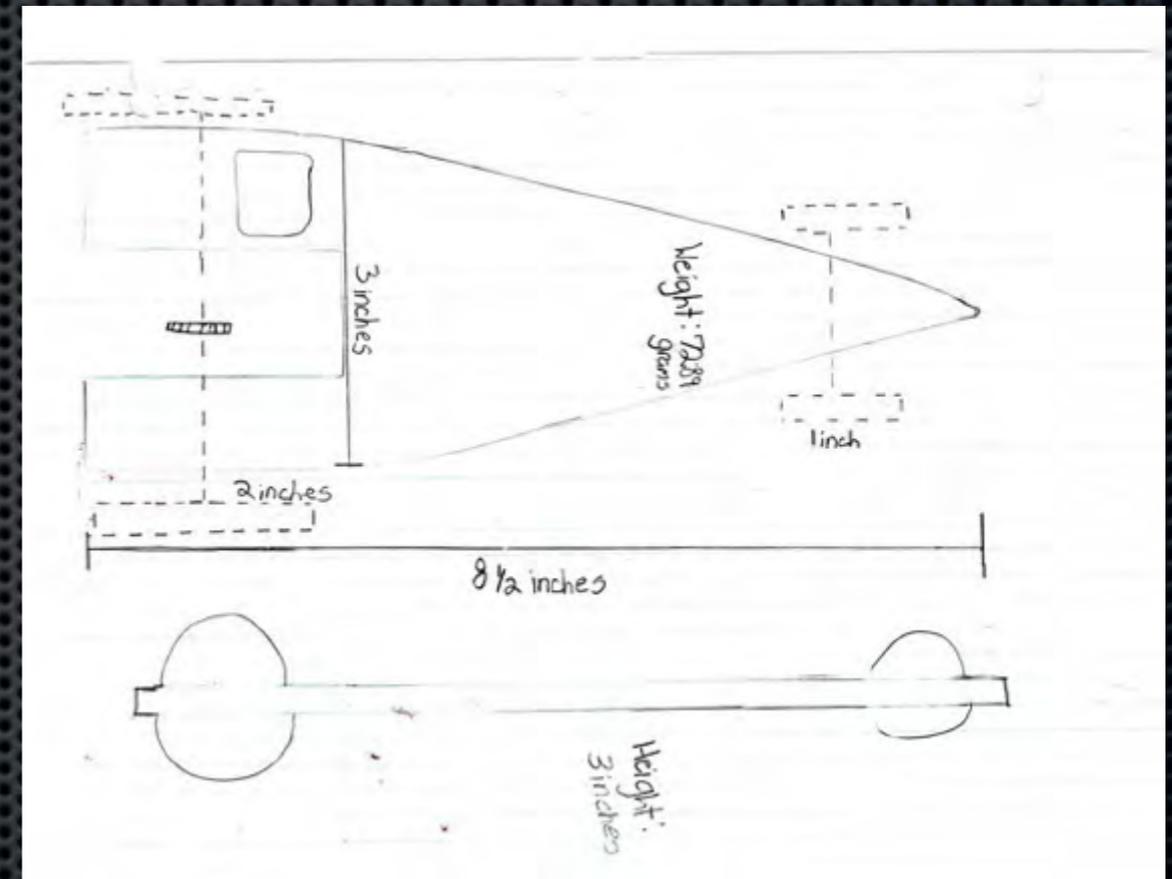
- 1) Photo & Basic Info
- 2) Design Documentation
- 3) Vehicle Feature Video

Photo & Basic Info

- ✦ Car/team name
- ✦ School name
- ✦ First name(s) and last initial of students on the team (no last names on the public page)
- ✦ Grade level of each team member
- ✦ Close-up photo of completed vehicle (use this as the featured image on your page)

Design Documentation

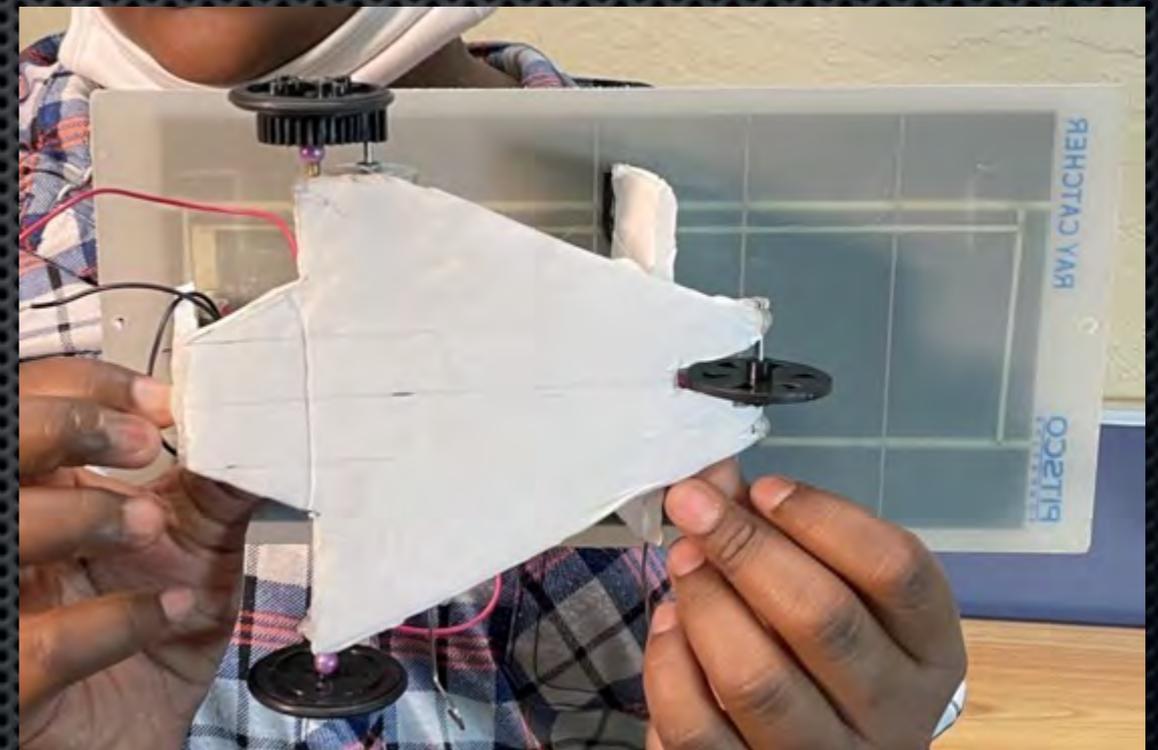
- Vehicle photos – min. 6
- Project log (documents the process, include obstacles, modifications, etc.)
- Design drawings (min. 2)
- Finished car specifications (measurements, parts used & cost)
- Test results (min. 3)



Vehicle Feature Video

Create Video

- Explain and point out car's special features
- Max 5 minutes
- Post to team's JSS webpage
- Hosted on FSEC's Vimeo site





Competition Day

What should you expect?

Check-in and Inspection

- ✦ Car is inspected for compliance with rules
- ✦ Receive passenger/payload (ping pong ball)
- ✦ Photographed



Judging

Awards

- ✦ 1st through 3rd place in each division
- ✦ Best Design
- ✦ Most Innovative - including material use and artistic elements
- ✦ Race Performance

Fix-It Tent

- Fix-it tent is open during race times
- Tools are available - spare parts are not



Time Trials

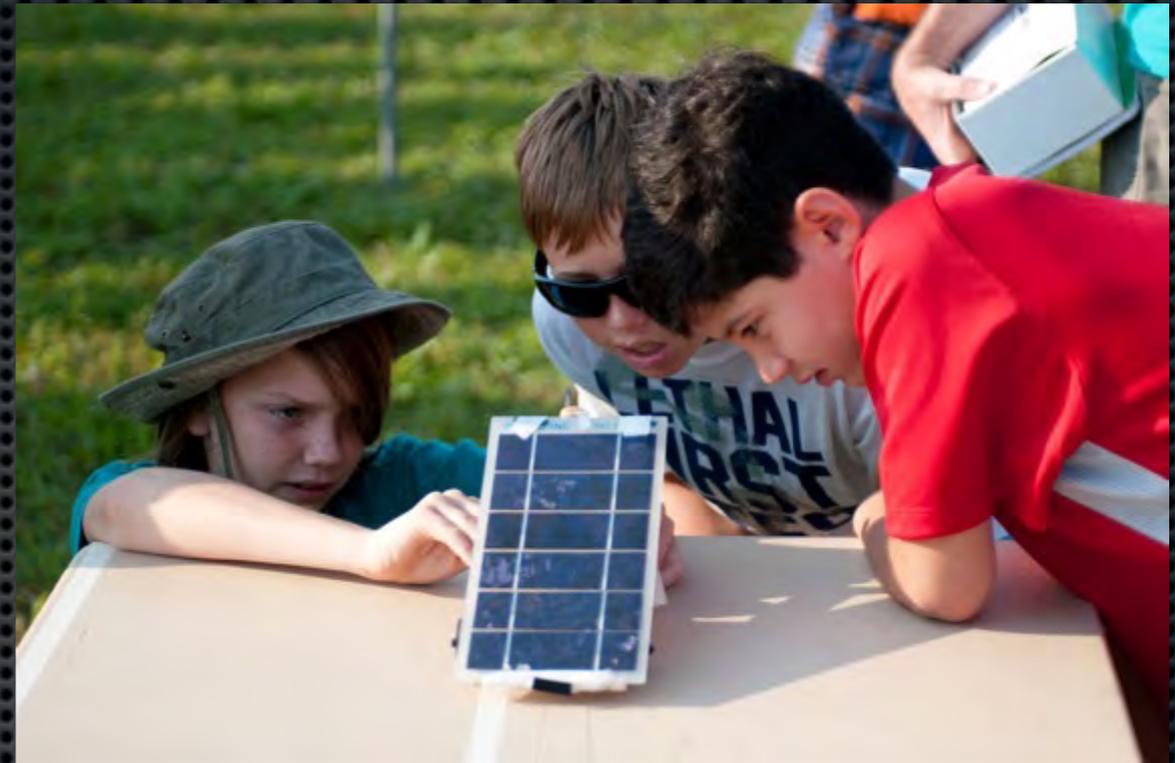
- Up to 3 trials (at team's discretion)
- Teams 'line up' whenever they choose
 - 1 or 2 cars run at a time
- Ten fastest cars advance to Double Elimination



Double Elimination

- Teams race two at a time according to posted race bracket
- Teams eliminated with second loss
- 1st, 2nd and 3rd places are awarded





Design

Construction considerations and tips

Parts of Your Car

- ❖ Chassis
- ❖ Transmission
- ❖ Wheels
- ❖ Motor + Power Source



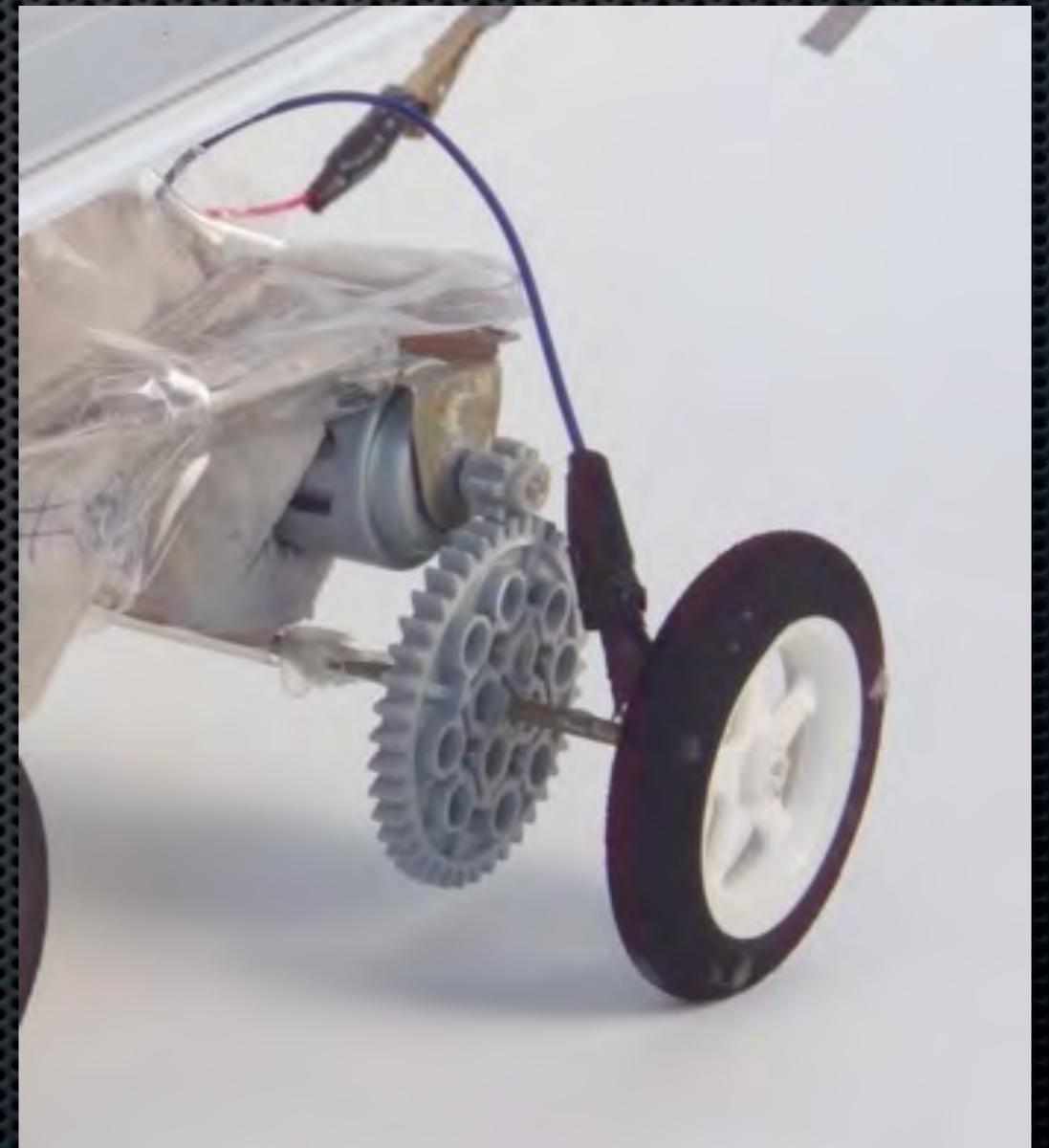
Chassis

- Lightweight!
- Rigid
- Secure mount for power source & motor
- Support all other parts
- 3 x 3 cm space for number



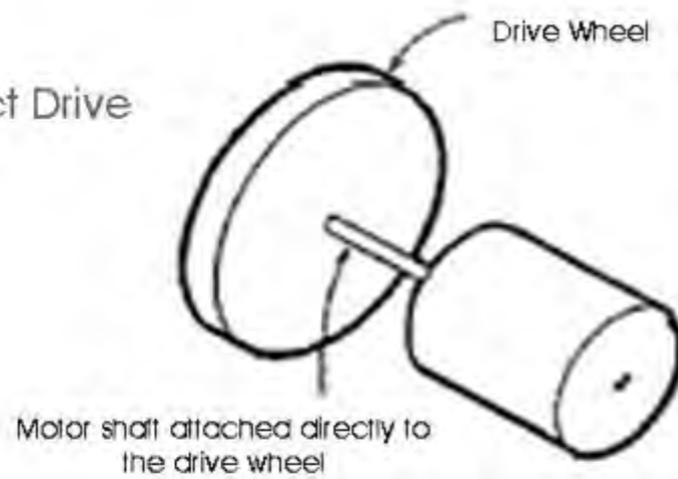
Transmission

- + Speed = - Torque
+ Torque = - Speed
- Gear drive is most common
- Most 'problems' occur here--power is lost with too much or too little friction/slack in the gears
- Hint: start with a 1:4 ratio, a rubber 'tire', and gears that mesh securely

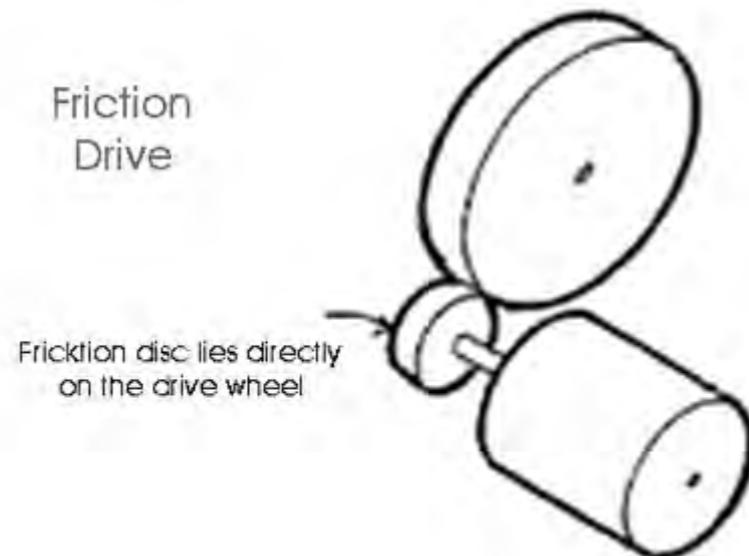


Types of Transmissions

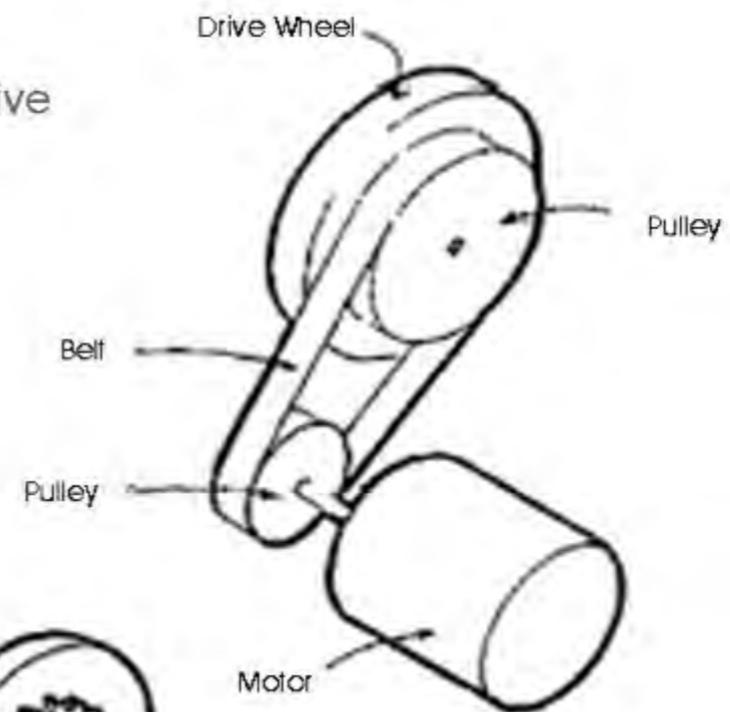
Direct Drive



Friction Drive



Belt Drive



Gear Drive



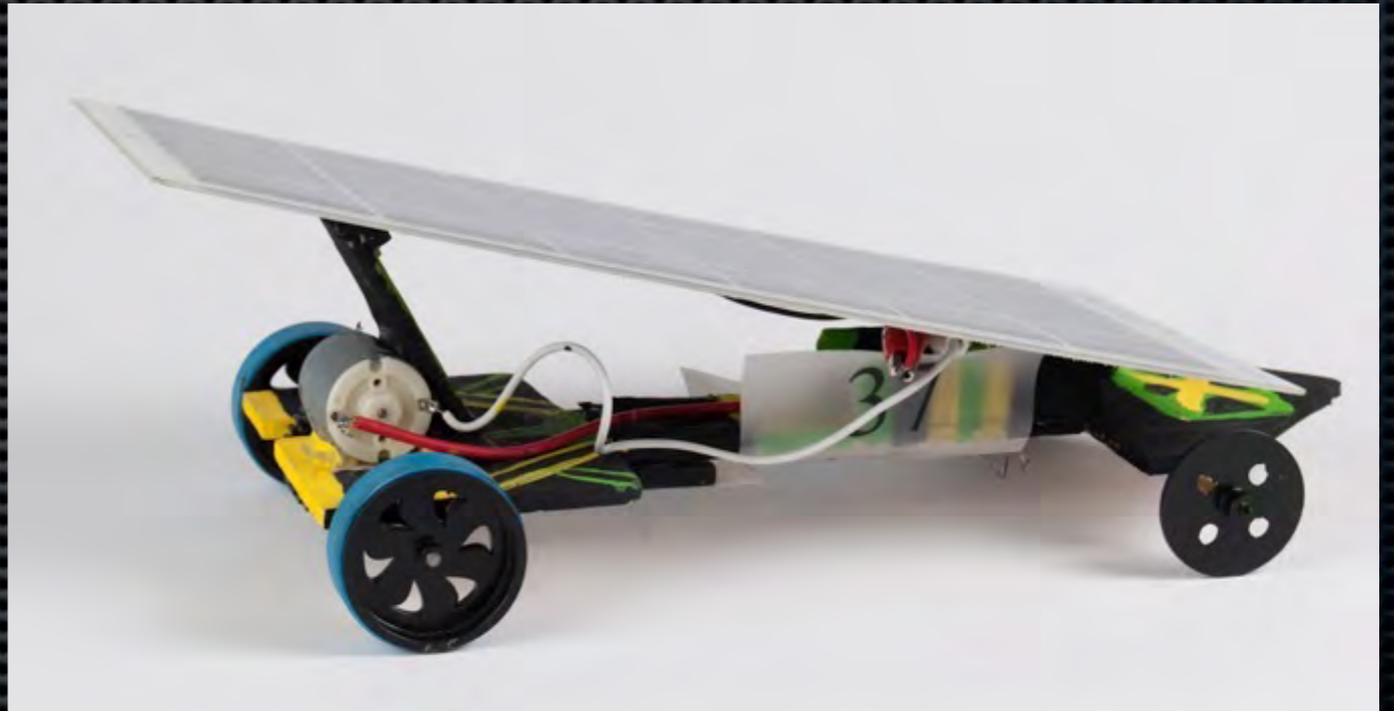
Wheels & Axles

- Lightweight & rigid wheels
- Use tires for 'just enough' friction
- Axle alignment is critical!
- Use low friction bushings
- Wheels are the “final gear”



Motor + Power Source

- Balance motor weight on chassis
- Affix motor securely so the gears mesh
- Reduce electrical resistance with solid connections
- Think about the angle of the panel



Troubleshooting

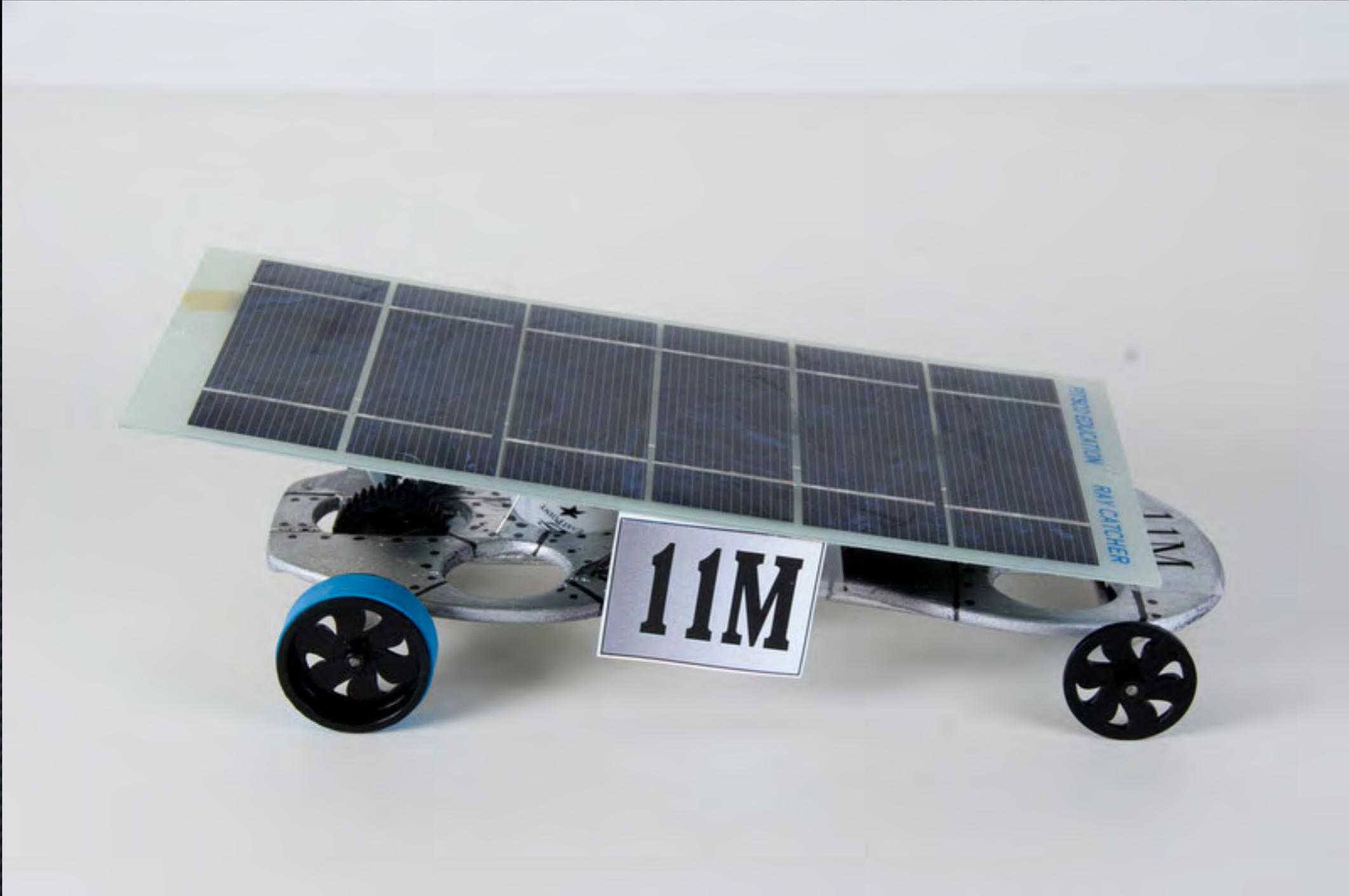
- Chattering gears
- Poorly selected gear ratios
- No power from source
- Too heavy
- Crude electrical connections
- Misaligned axles
- General build quality
- Eyelet causes extra friction



Making it real

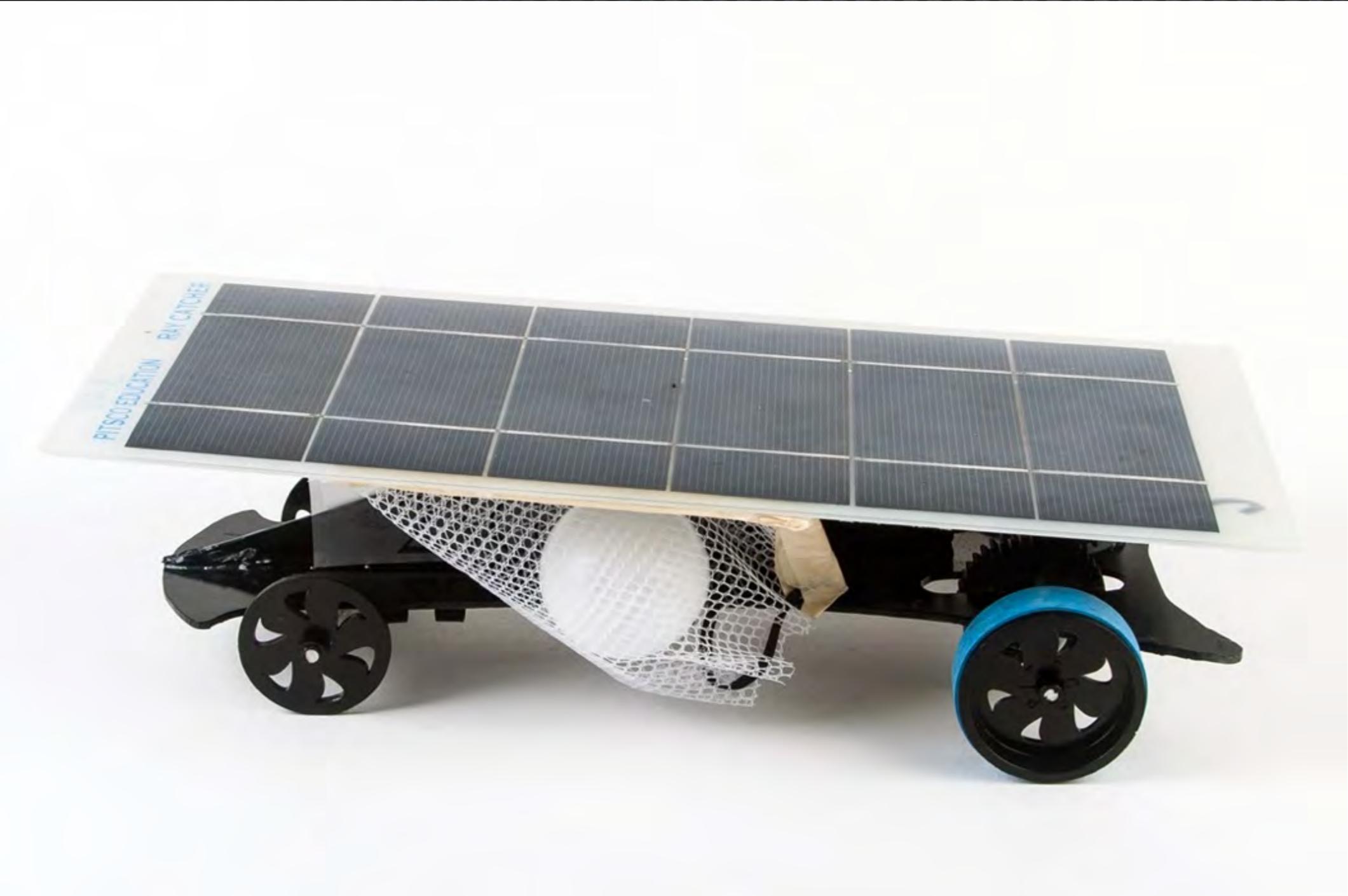




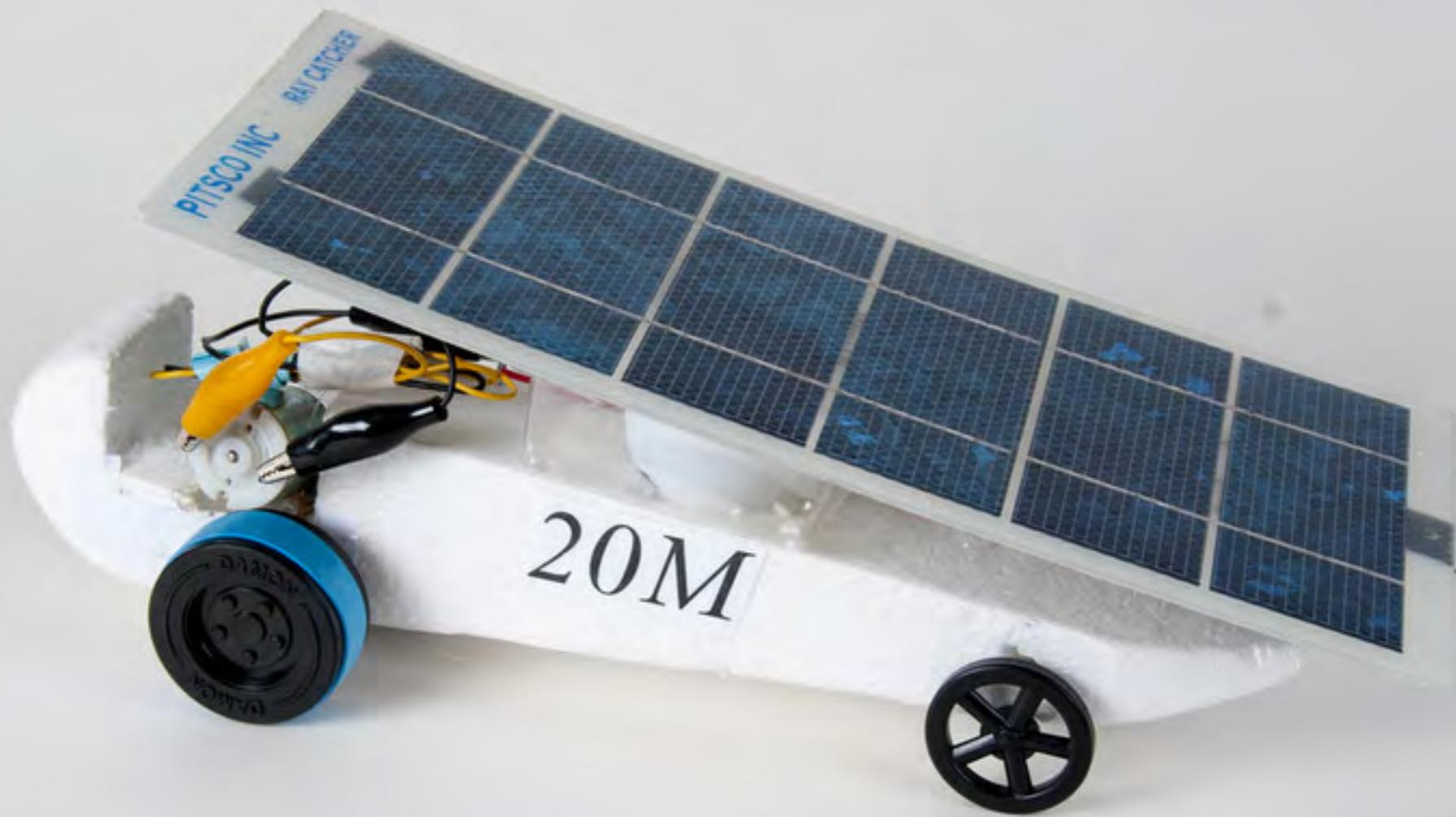


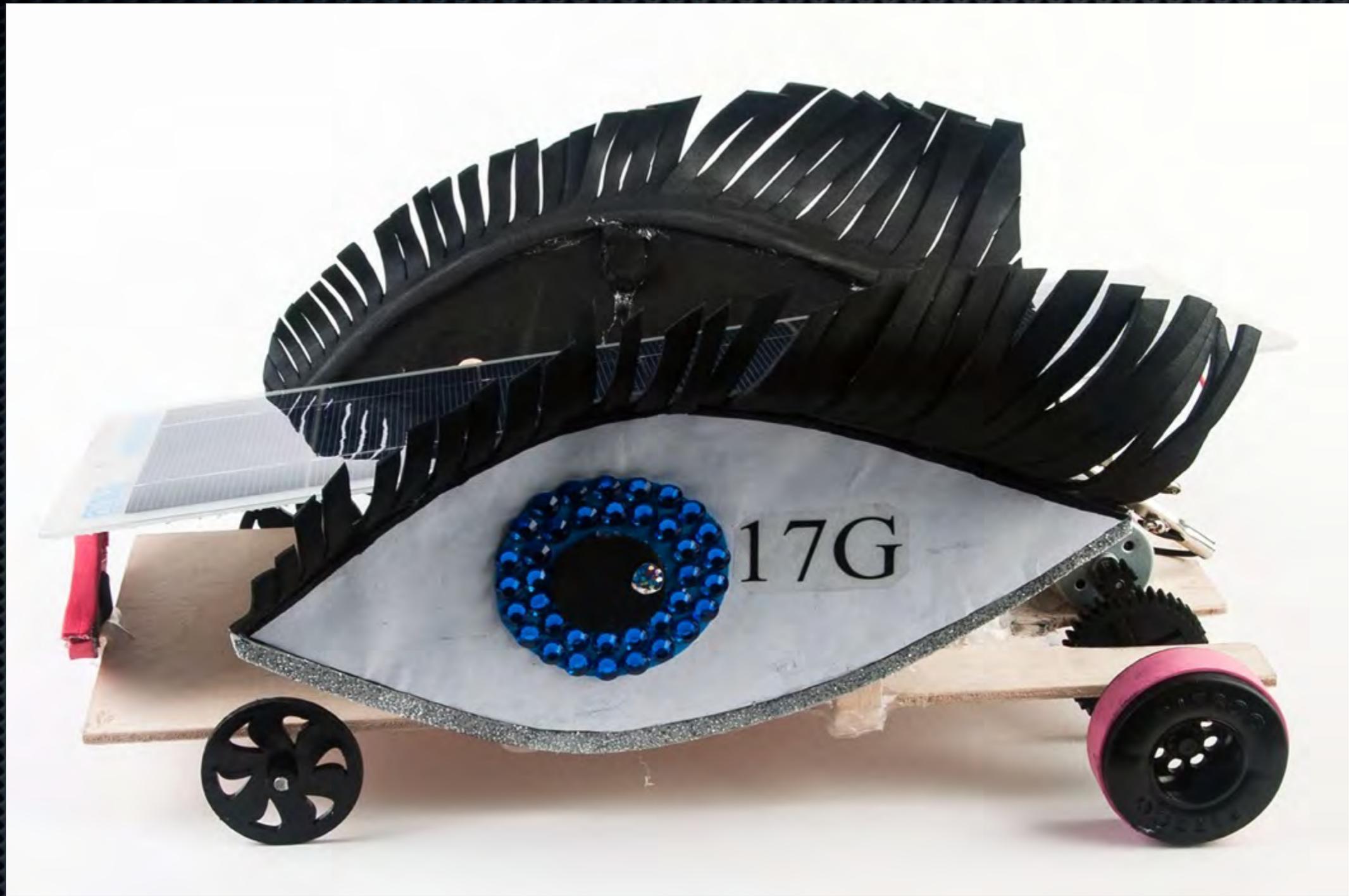














It's Your Turn!