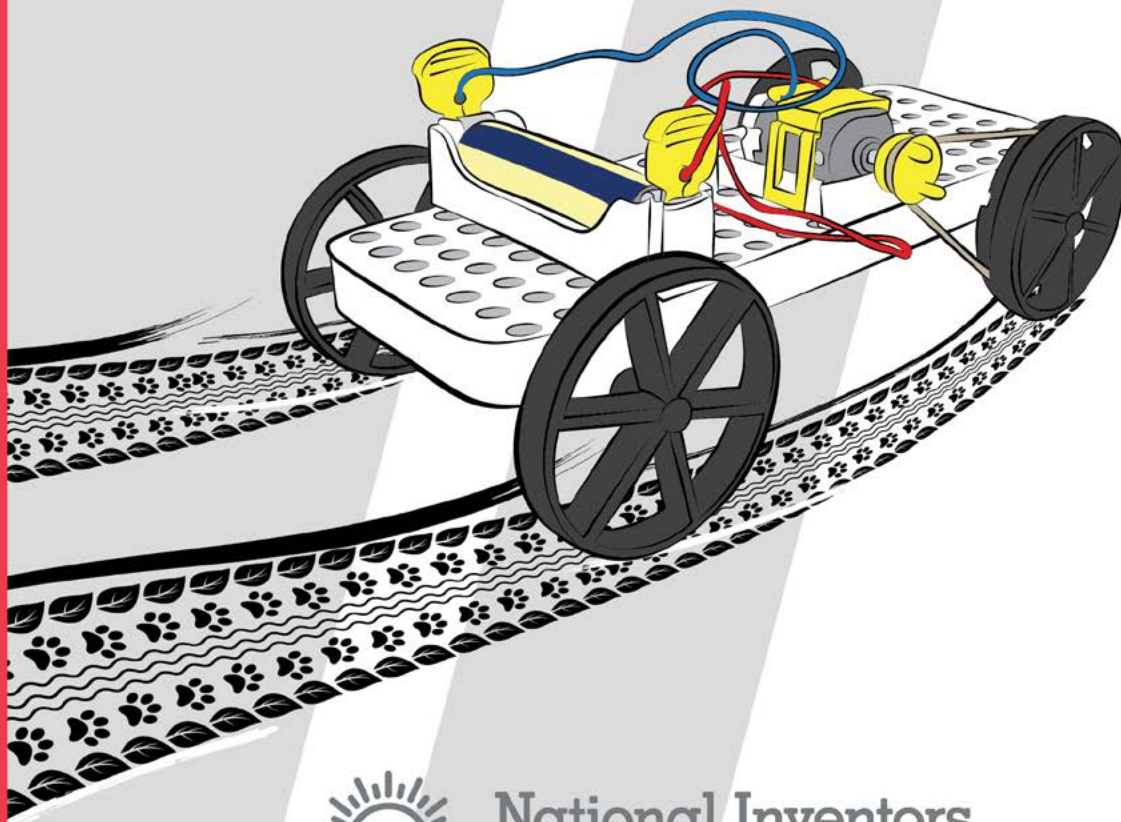




Road Rally



National Inventors
Hall of Fame®
EDUCATION PROGRAMS

**ROAD
RALLY™**

INVENTOR LOG

SAFETY AND HYGIENE



WARNING:

**Choking hazard—small parts.
Not for children under 3 years.**

- All activities require adult supervision.
- Ages 5+
- Read and follow all instructions.
- For safety and hygiene purposes, wash hands after each activity.
- Properly hold and use scissors. Do not run with scissors.
- Do not put materials in or near anyone's eyes, mouths, and ears.
- Do not play with or place plastic bags near the face or mouth.
- Ventilate the room when using markers.
- Do not apply temporary tattoos to sensitive skin, near eyes, or if allergic to adhesive.
- Batteries are only to be installed under adult supervision.
- Remove the batteries during long periods of non-use. Always remove exhausted batteries from the vehicle. Battery leakage and corrosion can cause damage.
- Dispose of batteries safely. Do not dispose of batteries in a fire. The batteries may explode or leak.
- If anyone has an allergy, remove any materials that may trigger an allergic reaction for them.



For an enhanced experience, access
music, posters, and videos online at
invent.org/recharge/roadrally



PASSWORD:

CARS

**FASTEN YOUR SEATBELTS FOR A HIGH-SPEED
ADVENTURE TO DESIGN YOUR OWN MORPHING VEHICLE!**



MEET A HALL OF FAMER

National Inventors Hall of Fame® (NIHF) Inductee Margaret Wu is a lab chemist. She made a new lubricant that helps car engines run smoothly and not wear out as much. Wu says that when she is working in a lab, ideas flow to her, and that is important for creativity. What would you like about working in a lab or with cars?

LEARN MORE ABOUT WU HERE: [INVENT.ORG/INDUCTEES/MARGARET-WU](https://invent.org/inductees/margaret-wu)

NATURALLY FUELED

YOU'LL NEED:



ENERGY

A green sea slug eats once and never again!

GREEN SEA SLUG

Have you ever heard of a creature that is part plant and part animal? Check out this PLANTIMAL!



The green sea slug might inspire the way cars are powered in the future.



Circle what type of fuel source and power boost you would like your vehicle to have.

Watch the Green Sea Slug video.



PLANT + ANIMAL
= PLANTIMAL



PROPELLER VEHICLE

YOU'LL NEED:



!
SAVE
YOUR SECOND
VEHICLE KIT AND
BATTERY FOR LATER

**You are ready to
assemble one of
your vehicles!**

**Watch the Propeller Vehicle
video and follow along, or use
the instructions on the next
pages to assemble your vehicle.**



!
PULL
BACK LONG
HAIR

!
MOTOR
WIRES ARE
FRAGILE

VEHICLE PARTS



VEHICLE BASE



WHEEL WITH
PULLEY RIDGE

WHEELS

AXLES



BATTERY HOLDER



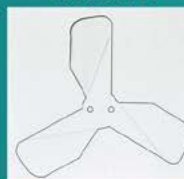
SUPPORT
PILLAR



PILLAR
FIXING PART



MOTOR



PROPELLER



PROPELLER
STOPPER



PULLEY



CONNECTING
KEYS



YELLOW
MOTOR
MOUNT

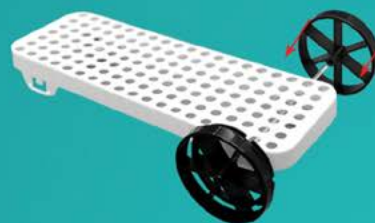
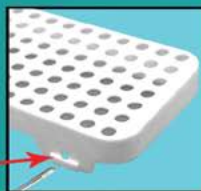


MOTOR
CLIP

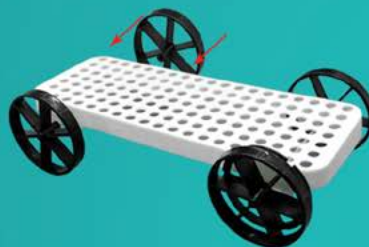
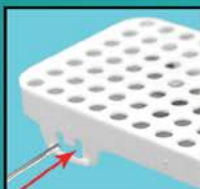
1

PULLEY RIDGE
WHEEL

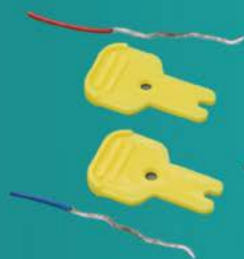
INSERT AXLE WITH
PULLEY RIDGE WHEEL
INTO THE SMALLER
AXLE HOLE.



2



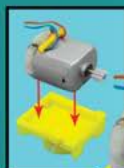
3



MAKE SURE ONLY
EXPOSED WIRE
IS WRAPPED!



4



PLACE MOTOR
AXLE NEAR EDGE
WITH TABS.

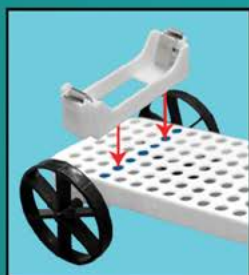
TABS

MOTOR
AXLE

KEEP WIRES PULLED
BACK AND AWAY
FROM MOTOR AXLE.



5



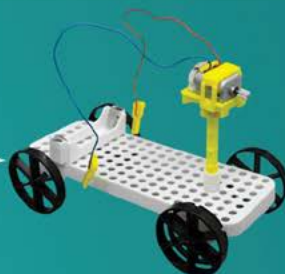
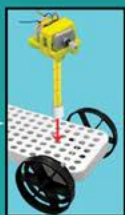
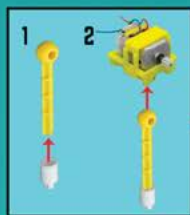
PLACE BATTERY
HOLDER IN 4TH ROW
FROM END.



BUILD
INSTRUCTIONS
CONTINUED ON
NEXT PAGE

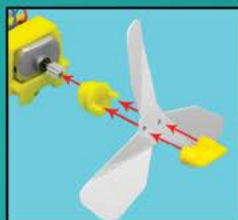


6



7

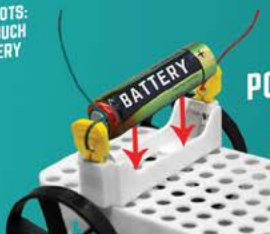
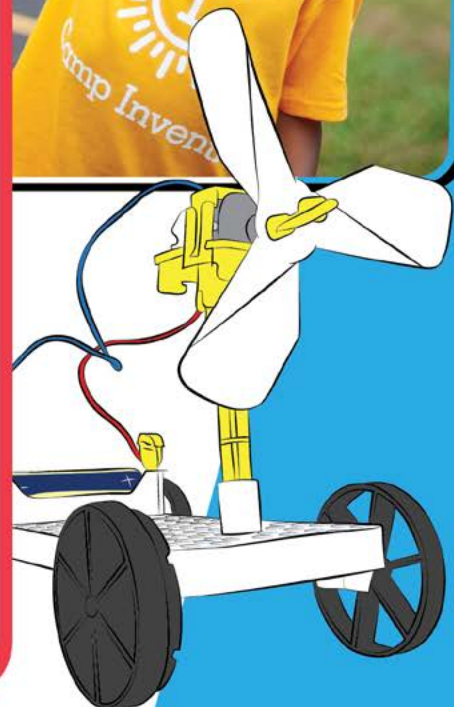
GENTLY FOLD!



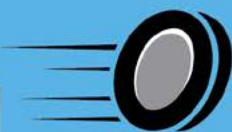
8

ALIGN THE
WHEELS!

9

INSERT KEYS INTO SIDE SLOTS:
THE WIRE METAL MUST TOUCH
THE METAL ON THE BATTERY
COMPARTMENT.POWER YOUR
VEHICLE!

TIME FOR A TUNE-UP!



Use these tune-up tips to adjust your vehicle. Take your best guess how each change might affect your vehicle's direction or speed, and then put it to the test!

**UNPLUG
ONE OF THE
CONNECTING KEYS
TO TURN IT OFF**

**SWITCH
THE KEYS**

**ADJUST THE TILT
OF THE MOTOR
AND PROPELLER**

**FOLD
BLADES LESS**

**FOLD
BLADES MORE**

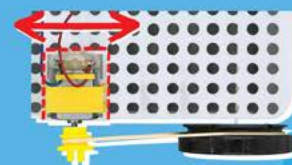
**MOVE THE PILLAR, BATTERY HOLDER,
AND/OR PULLEY MOTOR TO
DIFFERENT LOCATIONS ON THE
VEHICLE BASE**

MAKING A STRAIGHT RUN

ALIGN THE WHEELS



**MOVE THE PULLEY
MOTOR TO ADJUST THE
RUBBER BAND TENSION**



VEHICLE TROUBLESHOOTING

Align the wheels.

Give it a small push start.

**Check metal contacts on keys
and battery holder.**

Adjust the propeller folds.

**Wire disconnected from your motor?
Have an adult help strip the wires
and reattach using tape.**

PULLEY VEHICLE

YOU'LL NEED:



Change your car so that it uses a belt-and-pulley system instead of a propeller.

!
MOTOR WIRES ARE FRAGILE

Watch the Pulley Vehicle video and follow along, or use the instructions on the next page to assemble.



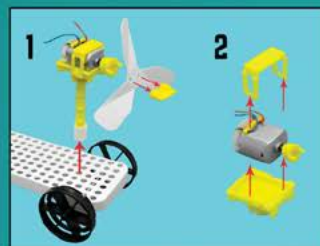
PULLEY

BELT

!
PULL BACK LONG HAIR

A pulley is a simple machine. Pulleys change the direction of the force applied to the rubber band and help move the attached object.

1



2



PULLEY NEAR
EDGE WITH TABS.

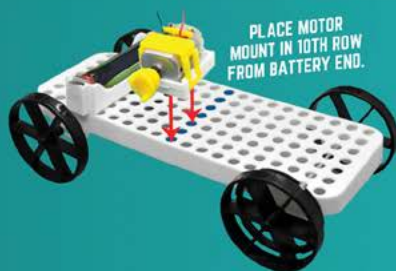
TABS



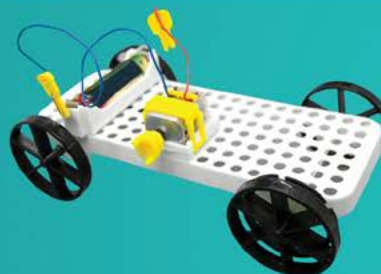
KEEP WIRES PULLED
BACK AND AWAY
FROM MOTOR AXLE.



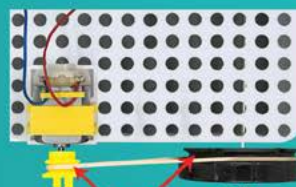
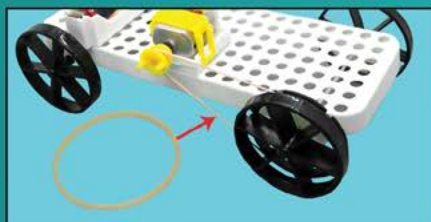
3



PLACE MOTOR
MOUNT IN 10TH ROW
FROM BATTERY END.



4



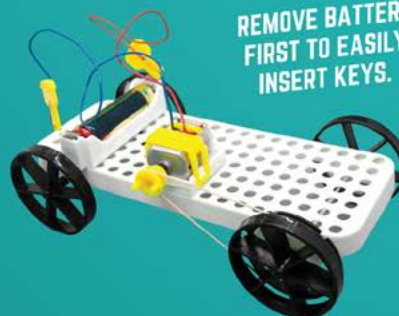
MAKE SURE THE RUBBER
BAND IS IN THE GROOVE!

5



ALIGN THE
WHEELS!

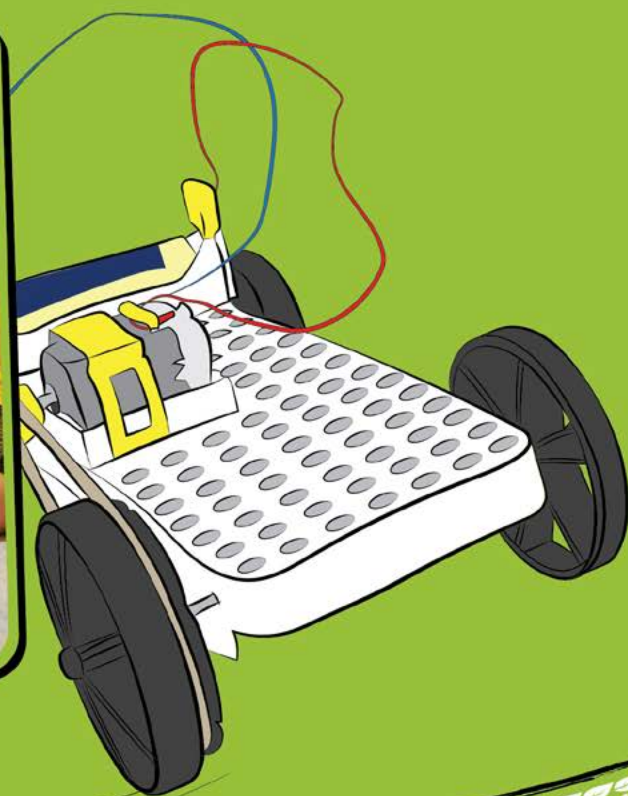
6



REMOVE BATTERY
FIRST TO EASILY
INSERT KEYS.

VEHICLE TROUBLESHOOTING

- Align the wheels.
- Give it a small push start.
- Give the pulley-ridge wheel a spin.
- Make sure the rubber band is in the groove of the pulley and wheel.
- Check that the pulley and wheel are aligned.
- Rubber band stuck? Use the end of a paper clip or pencil.



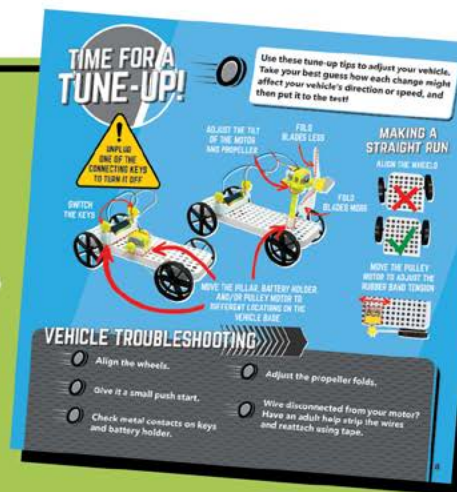
TIME FOR A TEST DRIVE

Experiment and change the position of any of the vehicle parts. Think about how it changes the vehicle's movement.

✓
SWITCH BACK AND FORTH BETWEEN THE TWO VERSIONS OF YOUR VEHICLE.

For a quicker zip, choose the pulley vehicle.

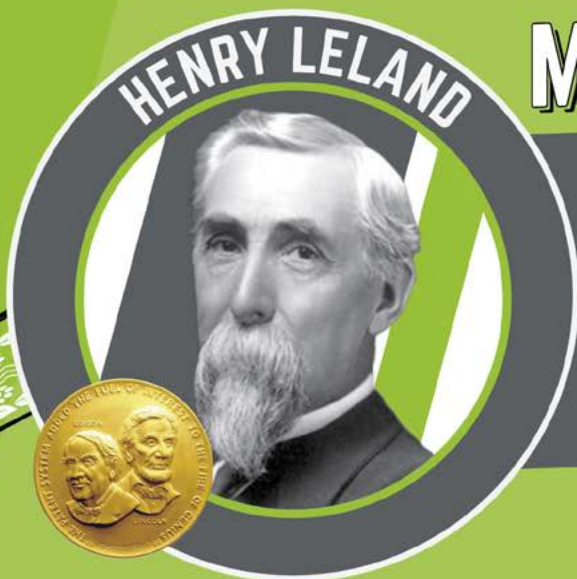
For more accurate steering, try the propeller vehicle.



MEET A HALL OF FAMER

NIHF Inductee Henry Leland had an idea to make cars that had interchangeable parts. Along with being an inventor and engineer, Leland was also an entrepreneur who created a new company to market luxury cars built with precision interchangeable parts.

LEARN MORE ABOUT LELAND HERE: INVENT.ORG/INDUCTEES/HENRY-M-LELAND



ENHANCE YOUR VEHICLE

YOU'LL NEED:



Check out this fish!
The frogfish has a rod and lure that hangs off the front of its head. Small fish sometimes mistakes the lure as food, and then becomes the frogfish's dinner.

Investigate features in nature.

Watch the Nature Cards video.



JOHN HOLLAND



MEET A HALL OF FAMER

If you are interested in exploring the world underwater, you can thank NIHF Inductee John Holland, who invented the submarine! This underwater vehicle has allowed scientists to investigate the movements and behaviors of aquatic animals like squid and octopuses up close and in their natural environment.

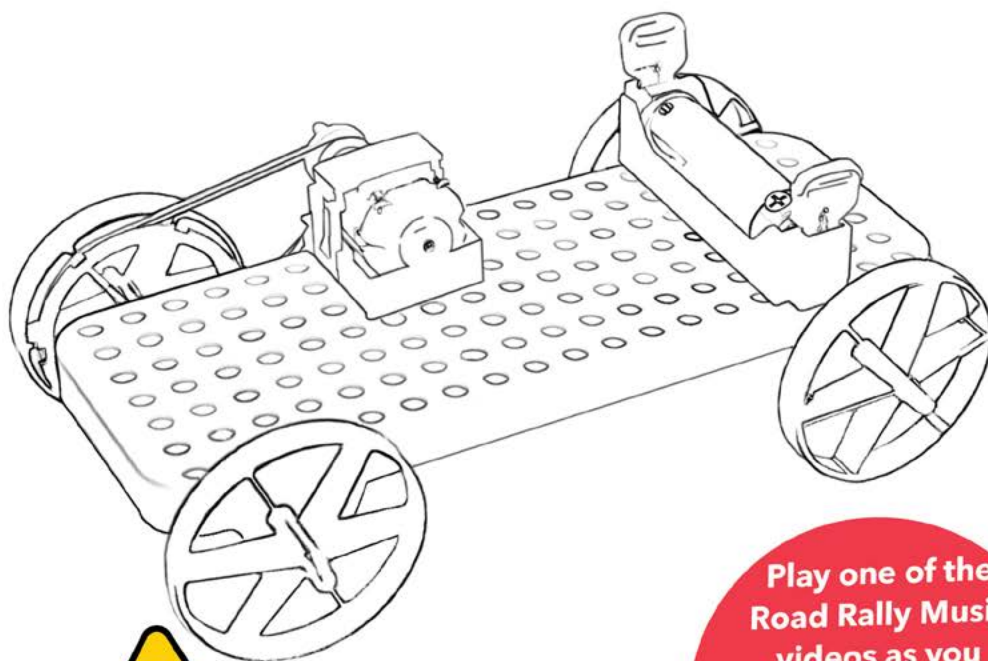
LEARN MORE ABOUT HOLLAND HERE: INVENT.ORG/INDUCTEES/JOHN-PHILLIP-HOLLAND



Now use the materials to add nature-inspired features onto your vehicle.



Brainstorm and sketch your vehicle design here!



Play one of the Road Rally Music videos as you sketch and build.



YOUR VEHICLE MUST:



Be lightweight and move on land



Be designed to morph for moving underwater and through the sky

1 2 3 4 5

Be inspired by at least five living organisms



Have a fuel source



Have at least one part that easily attaches and detaches

MORE TO EXPLORE

"Duck" trucks are a type of amphibious vehicle, which means it can drive on land and in the water. Some major cities use these "duck" trucks to drive people around the city as well as through the water to see the sights.

GET OUTSIDE!

CREATE AN OUTDOOR, ANIMAL-INSPIRED EXTREME OBSTACLE COURSE.

YOU'LL NEED:



Check out the different ways animals move and experiment with your materials!



Squid move using jet propulsion. They take water into their bodies and then force it out, which pushes them forward.

SWIM LIKE A SQUID!



Sea Stars move using hydraulics. They pull water in their bodies to power their tiny tube feet along each of their arms.

ADD WATER FOR A SPLASH!



Snakes undulate, or move in a smooth wave-like motion, sidewind, and creep forward!

WRIGGLE LIKE A SNAKE!



Remoras have suction cup-like areas on top of their heads that they use to attach onto sharks.

GRAB A RIDE TO TRAVEL LIKE A REMORA!

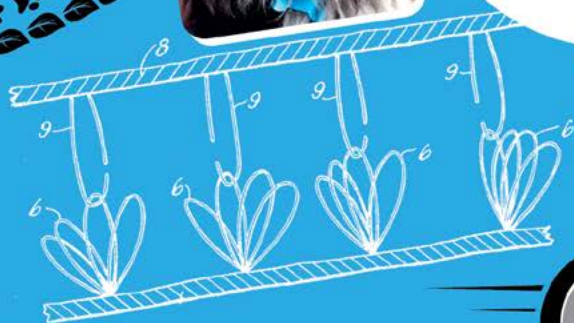
HOP LIKE A FROG!



Frogs use potential energy, which is stored energy, to leap. When the frog jumps, the potential energy is turned into kinetic energy, or energy in motion.



VELCRO®* Brand fasteners were inspired by burrs in nature that have small hooks and can stick to dog fur and other surfaces.



?

What other animal-inspired movements or themes will you add to your course?

**Feeling inspired?
Add more animal features
on your vehicle!**

* VELCRO® is a registered trademark of Velcro BVBA.

SUPER ROAD RALLY

YOU'LL NEED:



* Design may vary.

A road rally is a fun competition where vehicles complete a mapped-out course and sometimes complete challenges.

✓
DECIDE WHICH
VERSION OF
YOUR VEHICLE
WILL ENTER THE
SUPER ROAD
RALLY.

LET'S GET STARTED!

✎ Brainstorm fun structures like ramps (to go down but not up), obstacles, and tunnels.

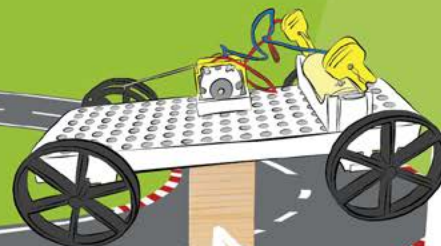
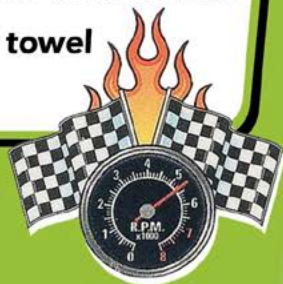
Build the structures!
Test and modify them
based on what you
discover.

✓
TUNE-UP AS
YOU GO!

START

Apply your Temporary Tattoo!

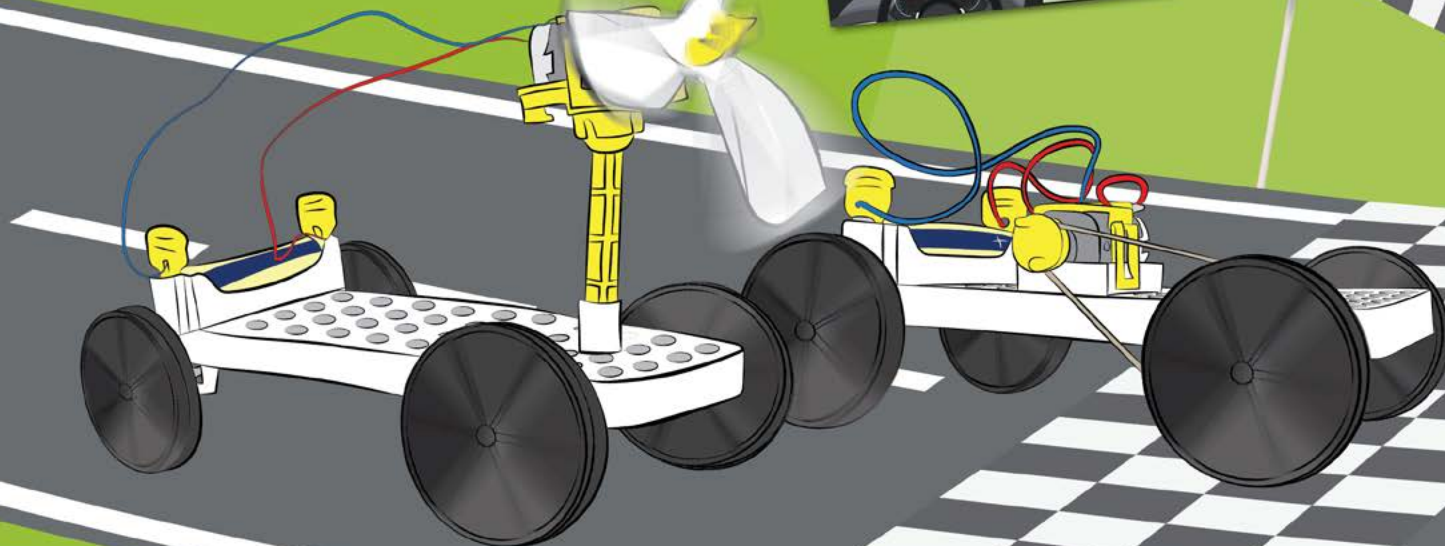
1. Remove the clear film.
2. Place the tattoo on your skin, image side down.
3. Wet a paper towel and press lightly on the tattoo for 30 seconds.
4. Remove the paper towel and tattoo paper.



Center of Gravity Challenge!

WOOD
BLOCK

Play the Super
Road Rally
Music.





**Congratulations on morphing
your vehicles and imagination
to discover the power of nature-
inspired design and engineering!**

WINNER'S CIRCLE



MEET A HALL OF FAMER

Sometimes making one small change can make a big difference in how a machine or device works. NIHF Inductee Mary Anderson added one new part to vehicles that forever changed what we expect when driving in bad weather. Anderson invented the windshield wiper, helping the driver and passengers see the road ahead more clearly during rain or snow for safer driving!

LEARN MORE ABOUT ANDERSON HERE: [INVENT.ORG/INDUCTEES/MARY-ANDERSON](https://invent.org/inductees/mary-anderson)

MORE TO EXPLORE

Nature holds the key to many of our design challenge questions. Whether we need to better understand how to build structures or reduce waste, nature is the ultimate example of efficiency. The next time you have a challenge that you are working on, take a walk and see what secrets nature may hold for you!



MEET A HALL OF FAMER

Driving vehicles on the road would be a lot more dangerous without the three-way traffic signal, invented by NIHF Inductee Garrett Morgan. An early fan of automobiles, Morgan quickly saw the need for better traffic control on crowded city streets. He sold his patent rights to a company called General Electric, which then made the electric version of the three-way traffic signal we all know and use today!

LEARN MORE ABOUT MORGAN HERE: [INVENT.ORG/INDUCTEES/GARRETT-MORGAN](https://invent.org/inductees/garrett-morgan)





ROAD RALLY

CHECK OFF EACH ACTIVITY
AS YOU COMPLETE IT!



Naturally Fueled



Propeller Vehicle



Time for a Tune-Up!



Pulley Vehicle



Time for a Test Drive!



Enhance Your Vehicle



Get Outside!



Super Road Rally

In partnership with

UNITED STATES
PATENT AND TRADEMARK OFFICE



general motors



National Inventors
Hall of Fame®

EDUCATION PROGRAMS

Learn more at invent.org

Road Rally Inventor Log

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