



Engineering in Nature Challenge Starter Kit

Everything you need to know to facilitate the Engineering in Nature Challenge!



curiositymachine.org

ARKive
www.arkive.org

The ARKive & Curiosity Machine Partnership

The Curiosity Machine and ARKive are partnering to bring the Engineering in Nature Challenge to educators all over the country during fall 2013. In this three-week program, students ages 11-14 can learn up to five different engineering concepts all from the natural world and test their skills through invention.

	Challenge	Engineering concept
	Build a beak	Simple machines
	Disperse seeds far and wide	Flight and gliding adaptations
	Light reflection in trees	Reflection and incidence angles
	Build a gliding bird	Aerodynamics of wings
	Engineer an octopus suction pad	Air pressure, vacuum and suction forces

There are two aspects to this project that make it unique from any other learning experience. First, teachers will be offered continuous support from ARKive and Iridescent team members through weekly Google Hangouts including kick-off and culmination hangouts. The team, along with this Starter Kit, will be available to introduce you to ARKive and the Curiosity Machine platform, troubleshoot any questions from the classroom and recommend additional wildlife imagery from ARKive. Second, each student will be paired up with a scientist working in the field that will offer advice and helpful feedback on the student's work.

In this Starter Kit, you will find all the information you may need to participate in the Engineering in Nature Challenge and in the corresponding Engineering in Nature Activity Pack, you will find the five dynamic Curiosity Machine and ARKive engineering design challenges mentioned above.

About the Curiosity Machine

The Curiosity Machine is a free online platform that hosts a collection of exciting design challenges for students which aims to encourage curiosity, creativity and persistence.

The challenges are based on cutting- edge research with over 20 videos featuring experts in the field and 50 building projects based on their work. On the website, students can submit pictures and videos of their designs. Once a student submits an answer, our online community of scientist and engineers will give feedback to improve their projects and reward their efforts using an online badge system. For more information on professional mentorship for the Engineering in Nature Challenge and the Curiosity Machine platform in general, please read the [Curiosity Machine Mentorship Philosophy](#). As a child progresses through the website, he or she will transform from Builder, to Engineer and finally Inventor. The challenges require the use of low-cost materials and are open-ended to encourage redesign and improvement.

About ARKive

ARKive is the world's largest online library of stunning images, captivating films and incredible biological information about threatened and endangered species. In addition to the online collection that currently profiles 16,000+ species with 100,000+ images and films, the ARKive Education team has created dozens of STEM-inspired, interdisciplinary curricula aligned to National Science Learning Standards and soon, the Next Generation Science Standards. These materials can be found via the learning portal, [ARKive Education](#).

Photos, films and educational content on ARKive are free for educators in the formal classroom to use in lessons, presentations, homework assignments and more.

Launching your Engineering in Nature Challenge using the Curiosity Machine

Step 1: Sign up for the Engineering in Nature Challenge!

Sign up for the challenge by filling out [this short Google Form](#). We will send you an invitation to join Google Hangouts with Curiosity Machine and ARKive team members and provide you any assistance you need during the three week challenge.

Step 2: Create a Curiosity Machine log-in

Create a login on the Curiosity Machine website and register as an educator. Steps for registration are detailed in the next section.

Step 3: Choosing your Engineering in Nature Challenges & Launch in the Classroom

Each project should be seen as a journey that begins with sharing the Curiosity Machine and ARKive nature videos and ends with the submission of the final challenge project to the Curiosity Machine website. You can choose to incorporate one, three or all five challenges in the three week period – it's up to you. Gather the materials and off you go!

Step 4: Students Submit Their Inventions and Talk to Real World Scientists

Once the challenge or challenges are completed, each student submits his or her work to the Curiosity Machine and receives feedback from real scientists working at top institutions such as Harvard, Stanford and more.

Curiosity Machine Registration

On the [Curiosity Machine platform](#), begin your log-in by clicking on the hand in the upper right corner that says “Sign in”. There are three distinct Curiosity Machine profile categories: mentor, education and learner. All three types of users utilize the same registration process. Establishing your role is important.

Who is a mentor?

You are scientists or mentors, typically at the college level or beyond. Your role is to work with and guide students as they build their own projects. Mentors have the ability to see and provide feedback to student answers, as well as award badges. Mentors can also upload their own activities to pre-existing videos, or add instructional videos to pre-existing activities. All mentors are trained and approved by Iridescent staff before interacting with students.

Who is an educator?

You are parents or teachers, and want to see more about the Curiosity Machine. You can observe all features of the website, including student projects and activities. Educators do not have access to submitting projects or creating new activities.

Who is a learner?

You get to build stuff! Learners have access to the activities, and can submit their own projects, the activity challenges to earn badges and become a master inventor. Learners can also view the submission of other learners to get inspiration.

Tip

Encourage your students to create their logins at home with their parents before your first course begins. Make sure they remember this information!

Details about Creating a Login

Students will create a login as a “learner”. Students will need to provide their parents’ e-mail address when creating a login.

Special Instructions for Learners under the age of 13

The Children's Online Privacy Protection Act of 1998 (COPPA) requires that any child under the age of 13 must provide a parental consent form before they can post his/her projects, videos and pictures in the website and interact with the Curiosity Machine community. The accounts for users under the age of 13 will be frozen until Iridescent receives the signed consent form from the child's parent or guardian. The parental consent form can be found [here](#) . Make sure to print it and bring to class for parents to sign. **You must send the completed consent forms to us before the child's Curiosity Machine login will work.**



Child participating in an Engineering in Nature Challenge by building a gliding bird

Here is an example of what an Activity page on the Curiosity Machine platform looks like.

The screenshot shows the 'Build octopus chromatophores' activity page. At the top, there's a navigation bar with the 'CURIOUS MACHINE' logo and a user profile for Mariana Rutigliano. The main content area features a video player titled '1. OBSERVE' with the video 'Roger Hanlon and the secrets of camouflage'. To the right of the video is a progress bar showing 'student's project progress' at 90%. Below the video is a five-star rating. On the right side, there are several circular icons representing different stages or components, and a 'collect badges' button.

Build octopus chromatophores

1. OBSERVE

Roger Hanlon and the secrets of camouflage

student's project progress

90%
80%
55%
30%

rating: ★★★★★

collect badges

Make a expandable pigment sac inspired by the squid's chromatophores that can stretch into as big a shape as possible.

Watch videos, read step-by-step instructions and get inspiration to complete the design challenges.

2. BUILD **EDIT THIS ACTIVITY**

Activity designed by *Kevin Miklasz*

The balloon represents the squids pigment sac. By cutting hole in the balloon and attaching string, you can simulate the way that muscles attach to the squids pigment sac and expand it open. Find the best way to position the attachment of the muscles to stretch open the pigment sacs as much as possible.

collect

- cardboard (can reuse boxes from the recycling)
- string or rubber bands
- scissors
- balloons

activity

1. Cut out a flat piece of cardboard into roughly the shape of a square, measuring 1 foot on each side.
2. With the scissors, cut up the balloon into some kind of flat rubber sheet. This will be your starting pigment sac, that you will need to stretch..
3. Using the scissors, cut small holes in the balloon near the edges. These holes will be the muscle attachment points. Loop a piece of string or rubber bands through these holes and tied them off. You can cut as many holes in as many places as you feel is necessary.

2) BUILD A SECOND DESIGN OR MAKE SOME MAJOR MODIFICATION TO YOUR FIRST DESIGN. HOW WERE YOU ABLE TO GET THE BALLOON TO EXPAND EVEN FARTHER THAN YOUR FIRST TRY? (25%)

hide answer



Instead I used string it also stretched. Not as much as I wanted.

NIK REDDY'S RESPONSE

GREAT IDEA!

What do you think the difference was between the string and rubberband? Why do you think the string stretched a little more?

Uploading Projects to the Website

Once the students build their designs, they must log into their accounts to upload the projects. You can support them as follows:

- Log in to the [Curiosity Machine platform](#);
- Find the activity that the student completed;
- Take a picture of the activity with an iPad, webcam, or computer with built in camera;
- Upload the picture to the site;
- Have students answer the questions on the website about their design;
- Once activities are uploaded, our engineers will give feedback and ideas for redesign within 48 hours.

The Value of Uploading Student Work to the Website

- Engineers will give feedback based on their knowledge of design and the professional field;
- Your students will get individualized feedback;
- The engineers will give further ideas for redesign and challenge children to continue creating;

And that's it! Are you interested in participating in the Curiosity Machine & ARKive Engineering in Nature Challenge? [Sign up now!](#)