InNature

Poster Topics

INNOVATION IN SCHOOLS
INSPIRED BY NATURE SOLUTIONS

The materials presented below are a rough outline of ideas that students may use to conduct science fair projects. This list is by no means comprehensive. I would also encourage you/them to visit Asknature.com and research other neat animals, plants, and systems that might be looked at to solve modern problems. Students are not strictly bound by the suggestions below, they are guidelines for the project are loose and may be modified. If you need additional assistance, have questions, or are unsure about the suggestions please see your instructor.

You will notice different ages beside the heading of each activity. This is a guideline for the age appropriateness of the material. If you have a student that is working at a higher or lower level you may talk with the instructor about having them attempt the project.

Here is a quick list of what is included in this packet:

- Shark paint
- Water strider eyes and de-icing planes
- Dolphin blubber absorbs heat
- Insect foot adaptations and footwear
- Armadillo Armor
- Beavers prevent the spread of wildfire
- Octopus Ink and printers
- Striped bass scales provide protection from penetration
- Phalaropes (birds) make water tornadoes to feed
- Whale baleen filters water
- Flowers reflect UV light to attract insects
- Animal ears funnel sound, better satellite and radio reception
- Monkey noses make sound louder
- Owl talons scoop up prey efficiently: the owl spork?
- Spider web designs provide strength, stronger buildings
- Bird feet are non-slip and stay on branches, non-slip surfaces
- Porcupine quills resist buckling and are strong, making building stronger
- Snakes have hinging vertebrate and skeletons, rail cars of the future?
- Termites have natural heating and cooling in their mounds, heating and cooling buildings
- Robots that mimic insects and arthropods
- Marshes purify water
- The under hairs of animals keep them warm, warmer clothes
- Honeycomb is super strong, stronger buildings

SHARK PAINT (all ages)

Problem: Airplanes, ships, and wind turbines aren't very energy efficient because of their "wind and water drag" as they move.

Animal Solution: Shark paint, using shark skin like stencils to help make planes, boats, and wind turbines more efficient.

Suggestions for Science Fair: Students should begin by research shark scales and the different shapes and varieties they come in. Then they should create a hypothesis about what shape shark scales will repel water best. Students can make 5-10 different models of shark scales using modeling clay, wood, vinyl, etc. and a control (a flat piece of untreated material) and test how water flows off the models. These models should have some size to them, at least 4" x 4" or larger. You will need to establish a constant way to test water repellency (does it bead up, run off, or just sit? What angles are required?). For younger students they may etch into the clay or surface, but for older students I would want to see good 3-D models. Record and chart data.

Website to start research: http://www.asknature.org/product/09b2f1ecaf4ba1641a99fbb9a9df6f59

WATER STRIDER EYES AND DE-ICING PLANES (all ages)

Problem: Ice removal is a costly problem for planes and roadways. Currently humans use a lot of environmentally "unfriendly" chemicals in this process.

Animal Solution: Water strider and mosquito eyes are heavily patterned, with many lenses. It's been proven that ice cannot adhere to patterned surfaces.

Suggestions for Science Fair: Research the shape of mosquito, bee, or water strider eyes (all very similar). Create a hypothesis around what designs or patterns might repel ice best. Create a variety of patterned surfaces in plastic, clay, or metal, using different materials such as brillo pads, knives (with parental assistance), or other scratching materials. Alternatively, students could use one shape and then change the size, density, and 3-D nature of the shapes. Test these shapes by seeing if water will freeze on them. For younger students I would suggest at least 5 surfaces and one control, for older students at least 8-10 with a control. Each surface should be tested at least 3-5 times in the freezer for replication. Take pictures and record data.

Website to start research: http://www.asknature.org/product/4feddb09a84cb65ac0ed01d2109fa731

DOLPHIN BLUBBER ABSORBS HEAT (5-7 yrs. old)

Note: (8-12 yrs. old) this could be done by older students if you come up with a good experimental design.

Problem: Humans need a way to keep warm in cold water when diving to deep depths.

Animal Solution: A layer of blubber or fat surrounding body organs.

Suggestions for Science Fair: Begin by researching blubber as insulation in animals. Students will also need to research the thickness of blubber of different animals. Have them student develop a hypothesis about the ideal thickness of blubber for insulation and warmth (is there a thickness at which there is no appreciable increase in insulating property?). Students can test the effects of different thicknesses of blubber against cold by using zip lock baggies and Crisco. The insulating properties of blubber can be tested using thermometers in zip lock bags that are placed in the zip lock bags of Crisco, of varying thicknesses, and then lowered into containers of ice (you'll need to make sure all the containers are the same "coldness). I would suggest doing this for at least 5 different animals (3 minimum). They can compare the temperature inside the bags at room temperature, freezing, and in ice water (you'll have to standardize this temp). For older students I would want them to come up with ideas about how thick blubber would need to be to help humans survive in cold water and how this could be used in a "suit" or other form to keep us warm. They can draw or design a suit, boots, gloves, etc.

Website to start research:
http://teachers.net/lessons/posts/4318.html
http://www.asknature.org/strategy/4e4b75ecdfded2328f1c9b080f8a55da

INSECT FOOT ADAPATAIONS (all ages)

Problem: Humans need to design shoes and footwear that are efficient on smooth and rough surfaces (all terrain).

Animal Solution: Insects have a variety of types of feet that allow them to walk on many different surfaces.

Suggestions for Science Fair: Start by having students research different insect feet online, spiders are neat, so are beetles, butterflies, etc. Then, using their research have students propose a hypothesis about how humans could design a shoe or shoe covering that could be used on different surfaces. You could build this using brushes, shoes, hooks, etc.

Testing isn't required but if you choose to test them then be careful and record data in charts and graphs. I would want to see at least one good design for younger students (tested on at least 8-10 different surfaces), and at least 2-3 different designs for older students (also tested on at least 8-10 different surfaces). For older students this may mean creating one design but altering it 3 different ways (example: shorter bristles, longer bristles, etched surface, not etched surface, etc....it's up to you).

Website to start research: http://www.asknature.org/strategy/3e99f80d5a7a396c73070744a026f3b1

ARMADILLO ARMOR (all ages)

Problem: Police vehicles need armor or protection.

Animal Solution: Armadillos have very strong but light armor.

Suggestions for Science Fair: Research the armor of the armadillo and then design or create a vehicle that has armor and transportation capabilities. Hypothesize about materials that could be used, how the plates and wheels would be placed, and how individuals would get in or out of the vehicle. Students should then build a model of their proposal using a model car, clay, or other materials. They should then highlight the features of this vehicle on the board along with their research. Alternately this could also be done making armor for a person, a soldier or police officer.

Website to start research: http://www.asknature.org/strategy/8d804e9b6c21ef5ac4ffcc7d5ab00616

BEAVERS PREVENT WILD FIRE SPREAD (8-12 yrs. old)

Problem: Wildfires often spread uncontrollably.

Animal Solution: Beavers, through their chewing of trees and formation of dams create mosaics of habitat that prevent the spread of wildfires.

Suggestions for Science Fair: Research how beavers build their lodges and dams, how they chew trees, and why this is important. Make a hypothesis about how scientists could study beaver behavior and propose different ways that humans could manage forests to prevent wildfires. This might mean making a model or landscape or making several drawings.

Website to start research: http://www.asknature.org/strategy/3894ef37f8730f96f55fc1d510d20075

OCTOPUS INK AND PRINTERS (all ages)

Problem: Controlled movement of ink for printers, both large and small scale.

Animal Solution: Octopi are very good at directing and controlling the ink they use to defend themselves from predators. They have very controlled jets.

Suggestions for Science Fair: Study the way that octopi squirt ink. Form a hypothesis about a type of jet or jets that we could create, as humans, to mimic the octopus and control ink flow. Test this by creating a variety of ink jets (you may want to study a printer first) this could be plastic cones, straws, droppers, etc. Using a water based ink see which one is the most controlled and easy to use to apply ink in lines and patterns. Students should test at least 5-10 different designs. You could present data based on "splatter," "straightness of lines," "crispness of lines" etc.

Website to start research: http://www.asknature.org/strategy/1f55e43a77015d2410721c5ae7262e54

STRIPED BASS SCALES PROVIDE PROTECTION FROM PENETRATION (all ages)

Problem: Green houses, cloth, and sails are subject to tears, rips, and penetration.

Animal Solution: Striped bass are fish that have scales that are protective and protect them against penetration.

Suggestions for Science Fair: Students need to research the structure and shapes of fish scales. They will then make a hypothesis about how scales can be mimicked (their layout, overlapping, shape) to make protective packaging. To test this students will then collect a series of small cardboard boxes (coffee mug boxes or mailing boxes might work it's up to you). They will then make "scales" using cardboard, plastic, or other material. They will then test how well the scales prevent penetration by using some sort of sharp pen, screw driver, etc. and a constant force (one student tries to penetrate the box). At least 3-5 designs should be made and tested. Qualities of protection should be noted for each design and the data recorded (information recorded should be things like flexibility, how well the scales attached, did the scales stay on, how the scales responded to the stress, etc.).

Website to start research: http://www.asknature.org/strategy/85e01f41e2fcd60cdbe94b45c2e54999

PHALAROPES (BIRDS) MAKE WATER TORNADOES TO FEED (all ages)

Problem: Debris from floods, rivers, and creeks often gets blocked around important areas that boats need to access, and vents in dams that need to stay clear.

Animal Solution: Phalaropes use their feet and bodies to spin in circles and pull food up from the bottom to feed.

Suggestions for Science Fair: Research the legs and bodies of phalaropes. Make a hypothesis about how the form of a phalarope can be used to remove debris from a dock or shoreline. Create model phalaropes with the same type of legs but different feet (sticks, straws, wooden pieces, wire that is wrapped), at least 3-5. Using tall cylinders (such as spaghetti jars, tall water bottles, etc.) put debris in the bottom (sand, bits of paper, plant matter, etc.) and then test your design and how the feet have to move (they may need to be attached to a "body" or model). Record how far up the column the debris travels, how the feet were turned or moved, and which model feet are more effective. You could also model this in a fish tank or aquarium. Record and present data.

Website to start research: http://www.asknature.org/strategy/46dcc0fe633a49274a5a22d36f6349be

WHALE BALEEN FILTERS WATER (all ages)

Problem: We need clean filtered water free of debris.

Animal Solution: Baleen whales filter water using baleen plates.

Suggestions for Science Fair: Research what baleen looks like and how it works. Make a hypothesis about shapes or strainers humans could make to filter water like whales do. Design a filter to filter out dirty water (or water with particles in it). This could be a strainer, a series of strainers, etc. but should be modeled after the whale's mouth. Test the strainer with different particle sizes in water and then record your results. You can make one or more models but I would want to see at least 5 different replications of water straining, and at least 5 different types of particles tested (sand, mulch, algae, etc.).

Website to start research: http://www.asknature.org/strategy/2ba41420d6714b3fd6b9a3c4d2465ab4 **and** http://www.asknature.org/product/19cf015cb42875f96279d581b9f66e35

FLOWERS REFLECT UV LIGHT TO ATTRACT INSECTS (8-12 yrs. old)

Problem: Humans need to find environmentally friendly ways to control insects during the day and at night.

Animal Solution: Insects see in a spectrum that we can't, so flowers have developed strategies to attracted them to flowers by reflecting UV light.

Suggestions for Science Fair: Students will research the types of flowers that attract different insects. They will then make a hypothesis about what insects see when they observe these flowers. Students will then test this by either using a UV light (cheaply purchased at a pet store for finding cat urine, or online) to look at flowers, by taking the UV light to a garden store or greenhouse and observing the UV light that is visible reflected from different flowers (be sure to ask permission). Pictures should be taken before and after (remember not to use a flash for the pictures with UV light). Record data on a chart and note any patterns that you see. Suggest ways that this UV reflection might be used for insect control.

Website to start research: http://www.naturfotograf.com/UV_flowers_list.html

ANIMAL EARS FUNNEL SOUND (all ages)

Problem: Find more efficient ways to funnel sound and radio waves from the air.

Animal Solution: Dogs, cats, and other mammals have cupped ears to focus and receive sound.

Suggestions for Science Fair: Have students research the ear shapes of many different types of animals. Develop a hypothesis about what shapes funnel sound the best. To test the hypothesis create ear shapes out of paper or other materials (furry surface?) and then test how well sound is received. Students should create at least 5-10 different ear shapes that they can hold up to their ears (suggestions might be rabbit, elephant, bat, dog, fennic fox, etc.). Use short bursts of sound (10-20 seconds) and have the participant rank which ears worked best on a scale of 1-10. Repeat this trail with as many adults, children, and seniors as possible. Propose ideas for how the best shape(s) could be used in modern problem solving.

Website to start research:
http://www.asknature.org/strategy/62a95372011f1f01e4f7ca0560e380c1
http://www.teachersdomain.org/resource/tdc02.sci.life.colt.lp_earshape/

MONKEY NOSES MAKE SOUND LOUDER (all ages)

Problem: Humans use a variety of devices to transmit sound, including speakers for music. We need low energy ways to amplify sound to make it louder.

Animal Solution: The proboscis monkey has a rounded nose that it uses to amplify sound waves.

Suggestions for Science Fair: Students should study and research different creatures that use sound to communicate, and how they amplify that sound across long distances (elephants, monkeys, frogs, bats, etc.). Create a hypothesis about the most efficient structure for amplifying sound. Test this hypothesis by building a variety of structures (round, long, circular, etc.) that can be put up to the speaker of a stereo (or a human mouth, it's up to you) and then record how this structure changes the sound and how far it travels. You'll have to be creative in data recording, students may want to do this outside v. inside, in a forest v. a parking lot, one student makes the sound while the other backs up until they can't hear it and then records the distance, using a sound meter, there are many options. Suggest ways that your results could be used to solve modern sound problems.

Website to start research: http://www.asknature.org/strategy/e7e90f1889214ebdaa4e2429380190e5

OWL TALLONS SCOOP UP PREY EFFICENTLY: THE OWL SPORK? (all ages)

Problem: Many children and adults have problems using forks and spoons to pick up food.

Animal Solution: Owls and bird of prey are very efficient at picking up food/prey with their talons.

Suggestions for Science Fair: Study the foot structure and design of owls or another bird of prey. Create a hypothesis about how owl foot design could be used to create a more efficient utensil for humans to use for food. Test this hypothesis using a variety of materials to create different types of potential utensils (at least 5-8). Test these utensils on a variety of individuals and food (at least 10 different people—seniors, adults, children and at least 3 different types of food such as soft, hard, crumbly). Record results.

Website to start research: http://www.owlpages.com/articles.php?section=Owl+Physiology&title=Talons

SPIDERWEB DEISGNS PROVIDES STRENGTH (8-12 yrs. old)

Note: will require a good bit of parental assistance.

Problem: Architects and engineers are constantly trying to find ways to create stronger bridges and buildings.

Animal Solution: Spiders have designed webs to maximize strength and minimize materials.

Suggestions for Science Fair: Students will research the shape of orb weaver spider webs, and the angles at which their supporting lines radiate from the center. They will make a hypothesis about which angles are strongest for supporting the web (for example the V shape, the X shape, the X shape etc.). Test this by using two 2.5' pieces of wood with eye hooks, and string in different formation. On the top of the structure add a larger eye hook and a scale that measures lbs. of pressure. See the diagram on second website listed. Students should create at least 3-5 designs should be tested at least 5 times each. Record and graph data. Make suggestions how this could be used in bridge design or modern architecture. (Note: this is not the only way to test strength, you can certainly come up with your own ideas!).

Website to start research: http://www.asknature.org/strategy/eb35ed12a8390522af70c7d5278763a0 **and** http://www.biomimicryinstitute.org/education/education/biomimicry-challenge-winners.html

BIRD FEET ARE NON-SLIP AND STAY ON BRANCHES (all ages)

Problem: Finding ways to make non-slip surfaces for rubber mats, carpets, and shoes.

Animal Solution: Perching birds, or passerines, have feet with bumps and ridges on the bottom that allow them to stay on slippery wet branches without falling off.

Suggestions for Science Fair: Research the different types of bird feet (this may include trips to a nature center to see stuffed or mounted birds). Create a hypothesis about what patterns (similar to bird feet) might work best for a non-slip surface (you can choose for shoes, rugs, mats, etc.). Test the hypothesis. This could be done in a variety of ways. Students could look at the bottoms of different types of shoes and then have participants demonstrate their gripping power (look for shoes that most closely resemble bird feet). Alternately they could carve into soft plastic or rubber and then test the gripping ability, or make a variety of model bird feet out of different materials and then test their gripping ability on wet surfaces (such as wet or lubricated dowels). If you need help see your instructor.

Website to start research: http://www.asknature.org/strategy/5680f9b6bfd74cef8aa9619b2ad48849

PORCUPINE QUILLS RESIST BUCKLING AND ARE STRONG (all ages)

Problem: Architects and engineers are constantly looking for ways to support buildings with light and minimal structures.

Animal Solution: Porcupines have quills with a hard outer covering and soft inner core (almost like foam or sponge) that gives the quills strength but makes them lightweight. This is also similar to bamboo.

Suggestions for Science Fair: Students will research the structure of porcupine quills (these can also be ordered online if you want to see real ones). Based on the structure of the quills the student will brain-storm about how they could build the pillars of buildings. For a hypothesis about which "pillar" design might be the strongest. Test this by using foam (purchased from the craft store). Make at least 3-8 different pillar designs (your choice, spiral, hollow, ridged, etc) that are large enough that they can be pressed down with a piece of wood (3" square or larger) and that weights can be added to. Test the designs and record which one held the most weight. You may have to play with this experimental design. I would want to see at least 3-5 replications of each pillar design test.

Website to start research: http://www.asknature.org/strategy/e61f1d7787150df465d03fa3894c225d **and** http://onlinelibrary.wiley.com/doi/10.1111/j.1469-7998.1986.tb03620.x/abstract (parents will need to help with the technical aspects of this reading)

SNAKES HAVE HINGING VERTEBRAE AND SKELETONS (all ages)

Problem: Rail cars, trains, and subways need more efficient switching mechanisms to help them turn.

Animal Solution: Snakes are very mobile and can undulate and move easily because they have skeletons with ball-joint systems.

Suggestions for Science Fair: Students should research what a snake's vertebrate look like (visit the Smithsonian Natural History Museum or see Mrs. Karen for a skeleton). Make a hypothesis about how this shape might be used for moving subway cars, trains, or rail cars. Create a model using cars or trains and mimic the shape of the snake's vertebrae for the hinging between the cars. Because there isn't really a good way to test the efficacy of this design I would like to see the student build the model and then draw or design at least 1-2 other possible models and present them. I would also like them to present what modern cars/train/subways use for hinging (this may require a trip to the train yard or metro).

Website to start research: http://animal.discovery.com/guides/reptiles/snakes/anatomy_02.html **and** http://www.phenomenica.com/2009/05/snake-skeletons.html

TERMITES HAVE NATURAL HEATING AND COOLING IN THEIR MOUNDS (8-12 yrs. old)

Problem: Humans use a great deal of energy heating and cooling energy, we need more efficient and "green" ways to do this.

Animal Solution: Termites have natural air conditioning and heating systems built into their mounds, because of the way they construct the mound walls.

Suggestions for Science Fair: The students should begin by researching termite mounds, how they are built, and what they are made out of. There is also great information about hotels and buildings that are already being made modeling termite mounds. Develop a hypothesis about how termite mound thermoregulation (keeping the mound cool and warm) might be used in building design. Test this hypothesis by constructing a variety of mound-like structures, that might be used for building design. Students could use clay, soil, found objects, recycled materials, etc. The design(s) must be based on termite construction. Test temperature and humidity using thermometers and humidity sensors (if you can find them). You may also want to do airflow tests (with a fan) or other creative testing (it's up to the student). Models should be at least 2'x2' or larger. For younger students they should create at least one building, for older students I would want to see at least 2-3 buildings and comparisons.

Website to start research:
http://inhabitat.com/building-modelled-on-termites-eastgate-centre-in-zimbabwe/
http://www.rshanthini.com/tmp/CP551/SDProjectPapers/BeyondBiomimicryTermites.PDF

ROBOTS THAT MIMIC INSECTS AND ARTHROPODS (all ages)

Problem: Humans are constantly seeking ways to build robots to help them in their everyday lives. It's difficult to make robots that can move and walk on a variety of surfaces.

Animal Solution: Insect and arthropods (crabs, spiders, ticks, etc.) are perfectly made for walking on a variety of surfaces and terrains.

Suggestions for Science Fair: Students should research different types of insects or arthropods that are good in a variety of terrains. Have them narrow down their selections to specific ones that they think are the most efficient (such as roaches, roly-polys, crabs, etc.). For younger students I would have them choose 1-2, for older students choose 2-3. Students will then hypothesize which design they think works best on a variety of terrains. Students should then test their hypothesis by designing model insects using motorized Legos. For younger students we would allow them to use pre-made HEX BUGS, but they must increase the number that they test to 5). After designing an insect "robot" then have them test their models on a variety of substrates or terrains (rocky, smooth, sloped, grassy, concrete, etc.). Have students test for specific periods of time, and record their results. They should then suggest ways in which these "robots" may be used to help modern humans.

Website to start research: http://www-cdr.stanford.edu/biomimetics/, http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=8812 **and** http://web.mit.edu/sangbae/www/

MARSHES PURIFY WATER (all ages)

Problem: Humans make a lot of waste water that often finds its way into the environment. We need sustainable ways to filter and clean our household waste water.

Animal Solution: Marsh plants have roots that actively filter and clean water that passes over them.

Suggestions for Science Fair: This topic could be done in a variety of ways, from container plants to actually going into a marsh and pouring water on the plants and seeing how much comes through. For the design students should research local Chesapeake Bay marshes, find out what plants are there, and what soils they live in. Students should then for a hypothesis. This will vary widely based on what they would like to test. One example would be that "x" plant filters water better than "Y" plant. Students could then set up containers of plants and then test them to see how "clear" or "dirty" water is when it is run through the plants (for older students I would expect more analysis of the water using test kits for water quality). There are quite a variety of tests that could be done. Because of this variety I would encourage you (as parents and students) to see your instructor before proceeding with design and testing, just to be sure you're thinking about variables and doing enough replication.

Website to start research:
http://en.wikipedia.org/wiki/Arcata_Wastewater_Treatment_Plant_and_Wildlife_Sanctuary, http://ag.arizona.edu/azwater/arroyo/094wet.html

http://tricia-edgar.suite101.com/marsh-plants-that-clean-grey-water-a114854
http://ecohousefilm.com/blog/water-purification-marsh

THE UNDERHAIRS OF ANIMALS KEEP THEM WARM (5-7 yrs. old)

Problem: Humans live in a variety of extreme weather conditions, and we are constantly looking for ways to keep warm.

Animal Solution: Animals have long fur, often with downy undercoats, that keep them warm. Sometimes this fur is layered, sometimes they have hollow hairs, and sometimes the hair is black, white, or another color.

Suggestions for Science Fair: Students should first research a variety of animals with fur that live in cool or cold climates, and how their fur is structured to keep them warm (hollow hairs, under coat, color, etc.). They should then make a hypothesis about what keeps those animals warm (this should be something testable). Using thermometers (and permission from those involved) students should then test their hypothesis. They could test this on a variety of local animals by using thermometers to measure the temperature of the animal at "skin level" below/at the base of the fur, on the top of the fur, and then the air temperature. For younger students this may be difficult to work with live animals so I encourage parental participation. They should do at least 3-8 animals and if possible do replications (repeat measurements) on different animals of the same type on different locations on their bodies. For example if they choose to do black cat fur they should measure temperatures from at least 3 cats and if possible at least 3 different parts of their body (back, side, tail). Record results and then present data. They should then suggest human applications.

Website to start research:
http://www.asknature.org/strategy/a6c07eedc1c944ac6605d5af4315aa20
http://www.asknature.org/strategy/53ad434e8f86efc6d3285e60ee02ff3a
http://www.asknature.org/strategy/38b4917e09a5eb76421b27bec586fb41

HONEYCOMB IS SUPER STRONG (all ages)

Problem: Builders are constantly looking at shapes and forms that would make their buildings stronger.

Animal Solution: Honeybees have found a way to make super light and super strong comb.

Suggestions for Science Fair: Students should research a variety of shapes and hypothesize about what shape would be the strongest for building a building. They could test this in a wide variety of ways, so I don't want to limit creativity. One suggestion would be to use cardboard, of a consistent brand or make, at least 5"x5". They could then cut the shapes they would like to test into the cardboard. They could then place the cardboard in a frame or holder and apply weight to see which shape held the most. For younger students they should create at least 3 different shapes and replicate (or test) their shapes at least 3 times each. For older students I would want them to create at least 5-8 shapes and test them at least 4 times each. Cutting may require parental assistance or help with an exacto knife. Students may also choose to do one shape and then test the size of the shapes, and see which one is optimal.

Website to start research:
http://www.worldcarfans.com/108112015021/honeycomb-tire-of-the-future

References:

https://serc.si.edu/education