

## **Scifest 2010 Project Ideas**

Ideas numbered 10, 11 and 12 are suitable for entry into the Discover Sensors' Special Award category

### **1: The need for speed**

The fastest one-mile land speed record, in a car, is 763 miles per hour. That's quick! The record was set by Andy Green in Thrust SSC (Super Sonic Car) in the Black Rock Desert, Nevada, USA on October 15, 1997. The car's one-mile run was – obviously – over in seconds, yet it took six-years to design and build the lightning-quick car. I wonder if they bothered fitting a speedometer?

Have you ever wondered how a speedometer works?

You might like to ...

devise a way of testing speedometers

devise a way of measuring traffic speed without using radar

design a speedometer for pedestrians or cyclists to use

compare the accuracy of different pedometers

Further links: <http://www.thrustssc.com/>

From the BA (British Association for the Advancement of Science)

Website: <http://www.the-ba.net/the-ba/utills/Sitemap.html>

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### **2: Bone shakers**

In the 1870s one of the most popular types of bicycle was the penny farthing. You've probably seen pictures of them – they have an enormous front wheel attached directly to the pedals, and a very small back wheel to keep it steady. The seat is directly above the large front wheel. In those days, they didn't have suspension and the roads were very uneven. So a ride on a penny farthing really shook your bones! Nowadays bike design has changed considerably; the two wheels are the same size. But the wheels are still pretty big compared to, say, a car.

Have you ever wondered why bikes usually have such large wheels?

You might like to ...

compare effort with speed for bikes with different wheel sizes

test the rolling efficiency of bikes, trikes, scooters, roller skates

compare different folding bikes. What comparisons could you make?

find out what injuries people usually suffer when they come off a bike

look at the design of helmets, over the years – how has it changed?

Further links: <http://www.alexmoulton.co.uk/>

From the BA (British Association for the Advancement of Science)

Website: <http://www.the-ba.net/the-ba/utis/Sitemap.html>

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### **3: Tell-tale splashes**

Are you a messy eater or painter, always spilling and splashing? Have you noticed how thick liquids, like tomato sauce or paint make different splash patterns from thinner liquids like tea or cola? Because thick liquids don't flow so easily, the splashes spread out less when they hit the surface. Blood behaves similarly. The pattern gives forensic scientists clues about what happened.

What can they deduce from the splash pattern?

You might like to ...

- investigate which liquids make good substitutes for blood (tomato sauce is too thick)
- devise experiments to compare splash patterns of substitute blood falling onto a horizontal surface under controlled conditions
- investigate the effects of height, direction and speed of the 'blood'; in other words, whether it drips under gravity or is squirted out under pressure.

Further links: <http://www.planet-science.com/whodunit/>

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### **4: Strange shaped bags**

Square, round, pyramid-shaped? Does the shape of your tea bag make much difference? We've been told (by dubious sources!) that pyramids are definitely better. Other adverts insist that round bags make all the difference. Perhaps we're all missing a trick and some form of three-dimensional, heptagonal construction is what we really need for tasty tea.

Have you ever wondered if different shaped tea bags make any difference to the way your tea brews?

You might like to ...

Investigate how many different shaped tea bags there are available, and note the varying costs

Work out how much tea is in each type of tea bag (see if there's really any less in bags that claim to be 'one cup' bags)

Conduct an experiment to see if tea brews quicker using different types of tea bag and loose tea

Design (and make) the ultimate 'quick-brew' tea bag

Further links: <http://www.teacouncil.co.uk/>

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## **5: Low fat crisps**

There's a woman in Chicago who has a collection of more than 4,000 crisps – each one resembling a celebrity. Crisp-a-like lover Nadine Lumford, says her most prized possession is her "Jesus crisp". She also has the inevitable Elvis crisp, as well as Princess Diana and Communist Karl Marx. According to Nadine, there's a celebrity crisp in every packet; you just have to look hard. I assume she didn't find her Elvis crisp in a low-fat packet. I also assume she has a vivid imagination.

Have you ever wondered just how much fat there is in a low fat crisp?

You might like to ...

Look at the labels of different brands of crisps. Rank them in order of high to low fat

Decide which brand of crisp you would recommend to someone wanting to follow a low fat diet. Remember: crisps contain other types of food as well

Calculate your body mass index (BMI), a measure of body fat worked out from your height and weight. Go to the BBC website to find out how

From the BA (British Association for the Advancement of Science)

Website: <http://www.the-ba.net/the-ba/utills/Sitemap.html>

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## **6: Salt**

There are lots of crisp flavours on the market, from pickled onion to crispy bacon. There was even a time back in the 1980s when you could get your hands on hedgehog flavour crisps. Having never eaten a hedgehog I can't vouch for their authenticity, but there they were, lining the corner-shop shelves. Yet despite this myriad of flavours, crisp manufacturers Walkers say their top three most popular snacks are the good-old-fashioned cheese and onion, salt and vinegar, and ready salted.

Have you ever wondered why some crisps taste saltier than others?

You might like to ...

Compare the salt content of different types of crisp or different flavours of the same brand of crisp

Find out how to carry out a chloride titration or use flame photometry to determine the sodium content of your crisp samples

Salt was once used as a preservative. Devise a simple experiment to find out if the crisps with higher salt content stay fresh for longer

Further links: BUPA

From the BA (British Association for the Advancement of Science)

Website: <http://www.the-ba.net/the-ba/utills/Sitemap.html>

Research has shown that reducing average salt intake to 6 grams a day would prevent 70,000 strokes and heart attacks a year. Some labels do give you the salt content of food per serving, but this currently only applies to a small number of foods; other labels on foods give the amount of sodium in grams per 100g of food. To convert sodium to salt, you need to multiply the amount of sodium by 2.5: 1 gram of sodium per 100g = 2.5 grams salt <http://news.bbc.co.uk/2/low/programmes/newsnight/3816735.stm>

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## **7: Crisp packets**

All types of packaged food have labels which give us essential information. Some of the information given is strictly regulated by the law. For example, anything that claims to be 'alcohol-free' must have less than 0.05% alcohol in it. Another important piece of information is the 'use-by' or 'sell-by' date. These are there to make sure we eat the food before it goes off.

Have you ever wondered how to keep your snacks fresh at the end of the party?

You might like to ...

Investigate the range of materials used to make crisp packets. Find out why manufacturers have chosen them. Find out what their key properties are

Design an experiment to find out which material keeps your crisps fresh for the longest period of time

Investigate the effect of temperature on the shelf-life of your crisps. See if some packaging responds differently to changes in temperature more than others

Further Links: <http://www.esa.org.uk/education/english/>

From the BA (British Association for the Advancement of Science)

Website: <http://www.the-ba.net/the-ba/utills/Sitemap.html>

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## **8: Soil**

Have you ever wondered what's in soil?

You might like to ...

compare different soils and investigate the types of plants that grow in them. You could look at the humus content, texture, pH or use a soil test kit to look at the content of nitrates, phosphates and potassium

look at the number of organisms, for example earthworms, living in different types of soil

see how the moisture content of a soil affects how well a plant will grow in it

make your own soil, designed for growing a particular plant, and see how well the plant grows

Further links: <http://home.howstuffworks.com/composting.htm>

From the BA (British Association for the Advancement of Science)

Website: <http://www.the-ba.net/the-ba/utills/Sitemap.html>

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## **9: Computers and dry eye syndrome**

It is a proven fact that working at a computer for long periods of time is one of the main causes of Dry Eye Syndrome. What is dry eye syndrome?

"The eye depends on the flow of tears to provide constant moisture and lubrication to maintain vision and comfort". Tears are a combination of water, for moisture; oils, for lubrication; mucus, for even spreading; and antibodies and special proteins, for resistance to infection. These components are secreted by special glands located around the eye. When there is an imbalance in this tear system, a person may experience dry eyes.

When tears do not adequately lubricate the eye, a person may experience:

Pain

Light sensitivity

A gritty sensation

A feeling of a foreign body or sand in the eye

Itching

Redness

Blurring of vision

Sometimes, a person with a dry eye will have excess tears running down the cheeks, which may seem confusing. This happens when the eye isn't getting enough lubrication. The eye sends a distress signal through the nervous system for more lubrication. In response, the eye is flooded with tears to try to compensate for the underlying dryness. However, these tears are mostly water and do not have the lubricating qualities or the rich composition of normal tears. They will wash debris away, but they will not coat the eye surface properly. In addition, because these emergency tears tend to arrive too late, the eye needs to regenerate and treatment is necessary.

(Ref: [http://www.medicinenet.com/dry\\_eyes/article.htm](http://www.medicinenet.com/dry_eyes/article.htm))

Why does working on a computer cause dry eye syndrome? For some people, working on a computer can lead to dry eyes. This could be because people blink less while using a computer. If computer users don't blink they don't moisten the eyeball surface and this causes the eye surface to dry out. Stopping to blink or rest the eyes can reduce this effect.

You might like to.....

Set up a control a control group of students

Monitor the amount of times each subject blinks per minute while using the computer. Repeat the observation three times and get a mean value

Estimate the gaze angle and roughly estimate the eye opening while using a computer

Repeat the experiment with the test subjects first while reading and then while relaxing

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## **10: Wind generated electricity**

### **(Suitable for the Discover Sensors Special Award)**

Windmills have been in use for thousands of years. The type of windmill still seen in Holland, were once more widespread. A typical windmill could do the work of 200 people. They have been used for many purposes, including grinding corn, pumping water and operating machinery. Windmills lost favour about a hundred years ago, when other forms of energy became cheaper and more reliable. Rising fuel costs and the fear of global warming are making alternative energy sources like windmills increasingly popular again.

Windmills that generate electricity are properly called wind turbines. They are made of a set of blades (sails) tilted at a slight angle and attached to a central shaft. The amount of electricity generated depends on several factors apart from the wind speed and wind availability.

Have you ever wondered how the wind could best be harvested to generate electricity?

You might like to.....

Investigate the effectiveness of different types of wind turbine; how many blades to use....what pitch (or angle) for the blade...what area of blade

Investigate the relationship between power generated and wind speed

Monitor the amount of useful wind in a day on hill-tops or by the sea, etc.

The wind speed is variable and so data logging could be used over an extended period and from the graph of voltage and current against time, an average power output could be obtained for a given turbine design or wind environment.

Further links: [http://www.teachnet.ie/dkeenahan/wind\\_turbines.html](http://www.teachnet.ie/dkeenahan/wind_turbines.html)

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## **11: Earthquake Victims (Suitable for the Discover Sensors Special Award)**

When buildings collapse and bodies are trapped under rubble, rescue workers are under pressure of time to locate the victims. You may have seen television scenes of rescuers using heat-detecting equipment. They often use infrared detectors to locate where the bodies are.

A simulation experiment might use bottles of hot water to simulate the heat from a live 'person'. Temperature sensors connected to the bottles could record the falling body temperature as time passes. The bottles could be buried under rubble at various depths and Infrared Sensors used to detect them. The Austrian scientist Josef Stefan found there was a relationship between the amount of radiant energy emitted from a body and its temperature. The depth of the rubble will also affect the level of radiation detected

Have you ever wondered at what point the search would be called off?

You might like to.....

Move infrared sensors over the 'disaster area' slowly and in a logical search pattern to find the 'hot spots'

Investigate the issues of time, depth and falling body temperature on the levels of infrared radiation detected

Further links: [http://data-harvest.co.uk/downloads2/Manuals/Sensors/DS056\\_Infrared\\_Sensor.pdf](http://data-harvest.co.uk/downloads2/Manuals/Sensors/DS056_Infrared_Sensor.pdf)

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## **12: A local ecosystem (Suitable for the Discover Sensors Special Award)**

Undertake a field study of a local terrestrial or aquatic ecosystem to measure abiotic variables using appropriate sensors. Many environmental factors affect living organisms. One such factor is climate. Measurements could be taken of such quantities as humidity, temperature (air and ground or aquatic), oxygen content, incident light, etc. These could be measured using sensors and datalogging, which offers the opportunity for measurement over relatively long periods of time in the open field. The results could then be brought back to the laboratory for analysis. This data might then be related to the distribution of organisms or an investigation could be undertaken to assess the extent to which one factor (e.g. light) might affect another (e.g. oxygen levels). Soil type or water quality, might also be investigated using a pH sensor.

Have you ever wondered why mist develops near ground level in the early morning?

You might like to.....

Compare a seashore habitat to a grassland habitat

Compare a hedgerow habitat to a woodland habitat

Compare the same habitat in two different seasons of the year

Investigate if the seasonal variation in temperature is linked to light intensity

**Further links:**

<http://biology.slss.ie/laboratoryandfieldwork.html>

<http://www.all-science-fair-projects.com>

- Has hundred of project graded by difficulty and topic
- Gives a full discription of how to do the project and equipment needed

<http://www.sciencefair-projects.org/index.html>

- Loads of project divided in catagories of Biology, Physics, Chemistry, Maths, Human Body & Technology
- Gives a full discription of how to do the project and equipment needed

<http://www.sciencemadesimple.com/>

- Ideas for projects
- Advise for creating your own individual project