

Annex:

Hong Kong Student Science Project Competition 2007

List and Brief Descriptions of Winning Projects

**(A) Invention Category**

**Champion**

**Project Title**      **Anti-bump Lock**

**School**              **Maryknoll Fathers' School**

**Description**        Locks keep our property safe but a "Bump Key" is commonly used by criminals to open locks quickly. This leaves few clues for the police and burglars are difficult to trace. Insurance companies may not compensate for any lost goods.

The Anti-bump Lock can prevent Bump Keys from functioning. The materials are the same, but at least two sets of the upper and lower brass pins are replaced by magnetic pins and mild steel pins. Magnetic and mild steel pins attract one other. A Bump Key cannot separate the pins so the lock cannot be opened. The cost of the Anti-bump Lock is relatively low because the pins are inexpensive.

We have done six tests to determine whether the lock is feasible: 1. Anti-bump test, 2. Pulling test, 3. Torsion test, 4. Magnetic force test, 5. Demagnetisation test, 6. Magnet durability test.

The results confirm the feasibility of the Anti-bump Lock. A Hong Kong patent, number HK1093659, has been applied for.

**First runner-up**

**Project Title**      **Mosquito Buster**

**School**              **Ho Dao College (SSY)**

**Description**        Mosquito prevalence in Hong Kong is very worrying. There are various products to combat mosquitoes but they are harmful to the environment and not cheap. The Oviposition Trap designed by the Food and Environmental Hygiene Department is still not a perfect solution. Now we have something different.

The Mosquito Buster is in two parts – a Mosquito Inducer and a Mosquito Combator. The Mosquito Inducer is a container with fruits which release carbon dioxide via an atomiser to the Mosquito Combator. The design attracts mosquitoes. The Mosquito Combator consists of bottles of different sizes. Its principle is to maximise the number of mosquitoes induced into a specially shaped funnel and trapping them there where they will lay eggs and not be able to escape.

In short, our invention is an environment-friendly, economical eco-product.

**Second runner-up**

**Project Title**      **Smoke Free Hong Kong - Indoor Air Cleaner**

**School**              **Tsuen Wan Public Ho Chuen Yiu Memorial College**

**Description** Our aim was to produce an air cleaner for smoking rooms with similar functions to air cleaners on the market but at a lower cost.

The main pollutants that we aim to remove include tar, carbon monoxide, carbon dioxide, dust and volatile organic compounds thus reducing the harmful effects of side stream smoke and improve air quality. Our method used cotton wool and filters with titanium dioxide and activated carbon. This greatly reduced pollutants leaving exhaust air clean and safe.

Most of the substances we used are environmentally friendly and easily replaceable

## Honorable Mentions

**Project Title** **The Hidden Power of Sewage**

**School** **St. Paul's Co-educational College**

**Description** The energy crisis and global warming are becoming more and more serious. Therefore, we propose a way to ease the problems by using the "hidden" energy in sewage.

Sewage flows down drainage pipes of buildings and the large amount of potential energy of the water is converted into kinetic energy and wasted. We decided to recapture the energy by inserting a hydro-electric power generator in the pipes.

Working principles: When water passes through the drainage pipe, it hits the turbine and spins it. The rotational force is brought to act on a dynamo and the electrical energy generated is stored in a battery.

Function: Recharging batteries of mobile phones, computers, electronic devices etc., providing energy during blackouts and/or for public services in building such as lighting.

Features: Inexpensive, easy to build and maintain, huge potential for development, eg in underground pipes.

**Project Title** **Run Away**

**School** **Y.C.H. Lan Chi Pat Memorial Secondary School**

**Description** Our product is an electrical cooling gel plaster. It acts as an effective heat reliever and minimises the weaknesses of traditional cooling gel plasters.

"Run Away!!!" is composed of a refrigerator, gel, a fan and a massager. The refrigerator helps cool the patient's forehead. The gel on the surface of the refrigerator lets the cooling effect spread evenly on the affected area and comforts the user. The effects are maximised by using both refrigerator and fan. In contrast to products on the market, the heat generated by the refrigerator is cooled down by the fan and the vibrating, adjustable massager can be adjusted by the rheostat.

"Run Away!!!" soothes fever, headache and dizziness. It is safe to use even for a long period either in the home or by aid agencies such as Medecins Sans Frontieres.

**Project Title** **Saltiness of Power**

**School** **Diocesan Girls' School**

**Description** Fossil fuels are a major source of energy for generating electricity. However, they are limited and burning them releases many air pollutants. Realising the energy crisis and environmental problems we all face, scientists have suggested various kinds of renewable energy. In our project, we tried to develop an alternative, renewable energy source – saline water power.

Based on the principle of osmosis which explains the movement of water molecules through a selectively permeable membrane, salinity power can be obtained by separating saline seawater and fresh river water in an estuary with a selectively permeable membrane. Fresh water will pass through the membrane into salt water, causing a rise in water level in the seawater chamber. As it gains enough potential energy, water is released to turn the turbine and generate electricity.

Saline water power is non-polluting and can be combined with existing infrastructures to reduce investment costs.

**(B) The Category of Investigation of a Scientific Phenomenon /Application of a Scientific Theory**

**Champion**

**Project Title** Anti-bacterial Chemicals (ABC)

**School** S.P.H.R.C. Kung Yik She Secondary School

**Description** The purpose of this study was to test disinfection by various natural agents and to develop a disinfectant harmless to humans and animals. A total of 31 samples were tested. Samples of various juices were extracted and a harmless strain of E. coli was employed for antimicrobial tests. We employed the Kirby-Bauer disk diffusion method in the tests. The results showed that of all the food samples tested, only vinegar, lemon, garlic and wasabi have an antibacterial function. These four food samples were mixed to produce a sterilising formula which can act as a daily cleansing agent. It contains no artificial chemicals. It is economical compared with other general cleansing agents and it is harmless for the environment.

**First runner-up**

**Project Title** Magic Fruity Meat - Tenderizing Enzyme

**School** Belilios Public School

**Description** This investigation compared the effectiveness of fruit juices, powdered meat tenderisers, ginger juice, wine and vinegar for tenderising meat. We also studied the effect of different volumes and soaking times of pineapple juice on meat tenderness. The effects on the meat tenderising action of pineapple juice of salt, sauce and pricking the meat were also explored.

Pineapple juice showed the strongest meat tenderising effect, followed by papaya juice, kiwi fruit juice and lemon juice. “S” was the most effective commercial meat tenderiser. Ginger juice was not effective and wine is better than vinegar. Pineapple juice performed the best, making the meat increasingly tender depending on the length of marinating and the volume of juice. Salt and sauce both slowed down enzyme activity. The recommended method is to prick the meat then marinade it with pineapple juice before adding seasoning.

## Second runner-up

Project Title **Biological Hydrogen Production**  
School **Heep Yunn School**

Description Hydrogen is used in nitrogen fixation, reduction of metallic ores, welding technology and as a fuel for both vehicles and rockets. It can also act as a clean fuel for generating electricity without creating greenhouse gases.

Nowadays tonnes of food waste are created everyday so why don't we do something useful with it? In this project, we try to make hydrogen out of food waste efficiently with a simple set-up and materials. We hope that this will make hydrogen more easily obtainable in future as a result of recycling.

## Honorable Mentions

Project Title **Bird Repellent**  
School **Carmel Pak U Secondary School**

Description Avian flu is a threat to mankind. The lethal H5N1 virus can pass from birds to human, so birds could cause a pandemic. Bird repellent with methyl anthranilate as the active ingredient is used to disperse birds in aircraft flight paths. It is both highly biodegradable and non-toxic.

In this project we investigated

1. the detection and quantification of methyl anthranilate in fruits, vegetables and plants
2. the characterisation of azo dye formed from methyl anthranilate
3. the use of methyl anthranilate in areas close to human activity, such as schools or homes to check the spread of bird-carried diseases like Avian flu.

Project Title **An Investigation on the Shape of Vortex in a Rotating Container**  
School **S.K.H. Lam Woo Memorial Secondary School**

Description Thomas Jansson pointed out that when liquid rotates at an accelerating speed, the vortex produced becomes unstable and forms many polygons. Our group tried this experiment and found some limitations. If the container and liquid were rotated together, we could not get positive results. Furthermore, we found that different kinds of liquid had different characteristics which affected the stability of the vortex. This meant that the vortex was not always polygon-shaped. Also, there was a special phenomenon where a vortex formed not with a point but with a line. The line then became an oval and then a circle. We can't explain this phenomenon yet but we're sure that we will be able to do so soon.

Project Title **Homemade Ecosphere**  
School **Ho Fung College (SSY)**

Description An ecosphere is an enclosed, self-contained and self-sustaining ecosystem. It is a miniaturised, simplified version of the Earth's ecosystem. An ecosphere can demonstrate the interdependence and interaction of organisms and the environment. However, ecospheres on the market consist only of expensive marine habitats with limited items for observation so we designed an ecosphere that includes a freshwater and a terrestrial habitat.

Our investigation was based on five main factors that affect its sustainability: (1) The population of the organisms, (2) Air-to-water ratio, (3) Size of ecosphere, (4) Amount of duckweed, (5) Light intensity. The results show the best conditions for setting up a long lasting ecosphere. It is very simple so we believe other students could set one up themselves and share the fun of learning about an ecosystem.

## (C) Energy Source and Energy Saving Project Award

### Awardees

Project Title  
School

**The Hidden Power of Sewage**  
**St. Paul's Co-educational College**

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Project Title  
School

**Power Consumption of stand-by-mode Electrical Appliances**  
**The Mission Covenant Church Holm Glad College**

Description

Many people think that energy is not wasted when electric appliances are left in stand-by mode. Actually, they are wrong! Though power consumption in stand-by mode is usually very low, leaving appliances in this mode continually throughout the year can consume a significant amount of electrical energy. The percentage of energy wasted in stand-by-mode might be greater than you think. If all of us ignore this and don't change our habits, our limited resources will soon be exhausted.

Our project investigates the energy consumption of appliances in stand-by mode. We hope it can provide data that will help us save more energy. If you do as we suggest in the investigation results you will save a lot of money and reduce pollution. Our sky will be blue again.

Project Title  
School

**Biological Hydrogen Production**  
**Heep Yunn School**

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