

# Science Enrichment Programmes **2010**



# CONTENTS

Introduction	02
Planning a visit to the Science Centre Singapore	
Hotlines	03
Opening Hours	
Admission Charges	04
• <i>Science Centre</i>	
• <i>Omni-Theatre</i>	
Institutional Membership Scheme	
Associate Membership Scheme	05
Exhibition Learning Resources	07
• <i>Climate Change</i>	
• <i>Discovery Zone</i>	
• <i>Genome</i>	
• <i>iSpace</i>	
• <i>Living with Viruses</i>	
• <i>Mathematics Everywhere &amp; Everyday Exhibition</i>	
• <i>Nanotech</i>	
• <i>PSLE</i>	
• <i>Sound</i>	
• <i>The Human Body</i>	
• <i>The Mind's Eye</i>	
• <i>The World of Energy</i>	
• <i>WATERWORKS – a fun, wet experience with water</i>	
• <i>Ecogarden</i>	
Gallery Pathways	14
Physical Sciences Programmes	
• <i>Physics</i>	19
• <i>Chemistry</i>	24
• <i>Mathematics</i>	28
Life Sciences Programmes	
• <i>Natural Science</i>	31
• <i>DNA Learning Lab Programmes</i>	34
SEED Programmes	40
Kitchen Science Programmes	41
Earth & space science programmes	43
Technology & Creativity Workshops	
• <i>Tinkerer's Lab</i>	46
• <i>Digital Design Studios</i>	49
• <i>Movie Lab</i>	51
• <i>Robotic Learning Centre</i>	55
Lecture and Discussion Series	67
Science Centre Corporate Induction Course	68
Science Resource	
• <i>STARLAB – A Portable Planetarium</i>	69
• <i>Discover Science Resources</i>	69
• <i>STaR Kits</i>	70
Omni planetarium Programmes	71
Science Outreach programmes	73
Snow City Programmes	76
Maps & Floor Plans	83
Science Enrichment Programmes Booking Form	87



## INTRODUCTION

The Science Centre Singapore, a statutory board under the purview of the Ministry of Education is a non-formal educational institution. The Centre aims to promote interest, learning and creativity in science and technology through imaginative and enjoyable experiences, and there by contribute to the nation's development of its human resources.

The Science Centre conducts a series of science enrichment programmes for students throughout the year. The Science Enrichment Programmes provide opportunities for students to learn science beyond the confines of the classroom, in a fun and enjoyable way. The programmes are specially designed to connect what teachers are required to teach in the classroom and aim to complement and support the school's science and mathematics curricula.

*The Science Enrichment Programmes are broadly categorised into the following categories.*

### **1) Classroom teaching**

Classroom teaching could be either lab-based workshops or lecture demonstrations. Lab based workshops refer to hands-on classes and are normally held in the laboratories for a class-sized group of students. The lecture demonstrations are usually conducted in lecture theatres, which can accommodate a bigger audience.

### **2) Gallery teaching**

Gallery teaching includes visit to the permanent exhibition with an accompanying worksheet and visit to the temporary exhibition with accompanying educational programmes.



## PLANNING A VISIT TO THE SCIENCE CENTRE SINGAPORE

1. Choose the programmes that you would like your students to attend.
2. You can book the programme using the booking form on page 87.
3. All bookings will be acknowledged. You may call us if you are in doubt about your bookings.
4. If you have to cancel your visit, please notify us in advance via call at 6425 2525/6 or email [schools@science.edu.sg](mailto:schools@science.edu.sg) so that we can offer your place to another school.
5. We welcome you to make a preliminary visit, familiarize yourself and be able to better prepare your students for the learning journey.
6. You may call us or email us if you require help to plan your visit.
7. Admission fee to Science Centre applies to Non-Institutional School Members.

### **Things to note before you come for our programmes**

1. Please be sure that you have a valid institutional pass to enjoy membership privileges.
2. Please bring along your sweater or jacket, as it may be quite cold in the classroom.
3. Please be reminded to have your meal before the lesson starts, as there will be no break provided during the lesson.
4. Please remember to bring along extra clothing if you are visiting the Water Works Exhibition.
5. Please do remember to bring along your water bottle when coming for our outdoor activities in the Ecogarden. A cold-water dispenser is located at the Ecolab.



## Arrival At The Science Centre

1. Please be at the Science Centre at least 15 minutes prior to a scheduled programme.
2. Upon arrival, please proceed to the ticketing counter with your school member pass (if applicable) and confirmation letter, for "Schools Group" registration at the Ticketing counter.
3. Our Visitor Service staff will print out the invoice (if applicable) as well as admission ticket for you before you proceed to the Turnstile.
4. Upon admission, our staff will show you & your students the way to the respective labs or auditorium.

## HOTLINES

<b>General information</b>	Tel : 6425 2500 <a href="http://www.science.edu.sg">http://www.science.edu.sg</a>
<b>Science Enrichment Programmes &amp; Omni-Theatre Programmes</b>	Tel : 6425 2525/6 Fax : 6561 6361 / 6565 9533 E-mail: <a href="mailto:schools@science.edu.sg">schools@science.edu.sg</a>
<b>Snow City Programmes</b>	Tel : 6560 2306 Fax : 6560 1297 E-mail: <a href="mailto:contact@snowcity.com.sg">contact@snowcity.com.sg</a>
<b>Outreach Programmes - Science on the Go</b>	E-mail: <a href="mailto:outreach@science.edu.sg">outreach@science.edu.sg</a>

## OPENING HOURS

The Science Centre is open to the public from Tuesday to Sunday and on all public holidays from 1000 hours to 1800 hours. It is closed on Monday except when Monday is a public holiday or school holiday.

The Science Enrichment programmes at the Science Centre are available to schools from Monday to Friday and Saturday mornings, except when it is a public holiday. However, the exhibition halls will remain closed on Mondays for maintenance works.

The Omni-Theatre is open to the public from Tuesday to Sunday and on all public holidays from 1000 hours to 2000 hours. It is closed on Monday except when it is a public holiday. Please log on to [www.science.edu.sg](http://www.science.edu.sg) for the confirmed titles and screening information.

The Snow City is open from Tuesday to Sunday and on all school and public holidays. The educational programmes are conducted from Tuesday to Friday only.



## ADMISSION CHARGES

### Science Centre Singapore

Admission is free for institutional and associate members from Tuesday to Saturday, except on public holidays.

<b>Public</b>	\$6 per adult \$3 per child (below 16 years)
<b>Organised group</b> (minimum 30 students)	\$5 per adult \$2.40 per child (below 16 years)
<b>School groups in uniform</b> (minimum 30 students)	\$2 per student <i>(Free admission for 3 teachers per group of 30 students)</i>

### IMAX Movies

<b>Public</b>	\$10 per adult \$5 per child (3-12 years)
<b>Organised group</b> (minimum 30 students)	\$8 per adult \$4.50 per child (3-12 years)
<b>Institutional / Associate members</b> (minimum 30 students)	\$3 per student (Primary Schools) \$4 per student (Secondary Schools, Centralised Institutes, Junior Colleges) <i>(Free admission for 3 teachers per group of 30 students)</i>

*For any special event involving an increase in normal admission charges, institutional and associate members will be entitled to special concession rates.*

All programme descriptions and prices are correct at the time of printing.



## INSTITUTIONAL MEMBERSHIP SCHEME

### Eligibility

The Institutional Membership Scheme is open to schools in Singapore under the Ministry of Education, which include primary schools, secondary schools, junior colleges, centralised institutes and institutes of technical education (ITE).

### Benefits/Privileges

- Teachers and students are entitled to a one-year free admission to the Science Centre for any number of visits.
- Special concession rates for any special event organised by the Science Centre.
- Free bookings of the Science Enrichment Programmes offered by the Science Centre. With the exception of some workshops for which a nominal fee for the materials will be charged per programme.
- Priority in the booking of educational programmes conducted at the Science Centre.
- Special discounts for Science Centre's publications.
- Free access to the Science Centre's reference library.
- Special concession rate to the Omni-Theatre.
- Special concession rate for the rental of Science Centre facilities.
- Issue of Science Centre Learning Passport – get rewarded with a 30 min outreach science show/talk conducted at your school with every 1,000 students participated in the educational programmes at Science Centre.
- 1 year free subscription of "Singapore Scientist" magazine, two copies per issue (3 issues per year).

### **Conditions for Membership**

1. The membership is not transferable.
2. Membership pass will be issued within 2 weeks of payment.
3. A discount of \$25 off the joining fee will be given to members who renewed an existing membership before expiry date.
4. Membership is valid for one year commencing from the date of payment received.
5. To enjoy free admission to the Science Centre, a valid membership card has to be presented to the Ticketing Staff at the main entrance for registration.
6. In case of misplaced card, please notify the Science Centre immediately in writing. A nominal fee of \$5 will be levied for each replacement card.

### **Subscription**

The annual subscription fee is based on the size of the institution's student enrolment.

<b>Student Enrolment</b>	<b>Annual Subscription</b>
2000 and above	\$600 + 7% GST
Below 2000	\$500 + 7% GST

## **ASSOCIATE MEMBERSHIP SCHEME**

### **Eligibility**

The Associate Membership Scheme is open to local institutions except Post-Secondary/Tertiary Institutions registered under the Ministry of Education.

### **Benefits/Privileges**

- Teachers and students are entitled to a one-year free admission to the Science Centre for any number of visits.
- Special concession rates for any special event organised by the Science Centre.
- Associate members are entitled to book the science enrichment programmes offered by the Science Centre.
- Special discounts for Science Centre's publications.
- Free access to the Science Centre's reference Library.
- Special concession rate to the Omni-Theatre.
- Special concession rate for the rental of Science Centre facilities.
- 1 year free subscription of "Singapore Scientist" magazine, two copies per issue (3 issues per year).

### **Conditions for Membership**

1. The membership is not transferable.
2. Membership pass will be issued within 2 weeks of payment.
3. A discount of \$25 off the joining fee will be given to members who renewed an existing membership before expiry date.
4. Membership is valid for one year commencing from the date of payment received.
5. To enjoy free admission to the Science Centre, a valid membership card has to be presented to the Ticketing Staff at the main entrance for registration.
6. In case of misplaced card, please notify the Science Centre immediately in writing. A nominal fee of \$5 will be levied for each replacement card.

### **Subscription**

The annual subscription fee is \$1,000 + 7% GST



# Membership Application / Renewal Form

(Please tick appropriate box)

## Institutional Membership

- New Applicant
- Membership Renewal  
Current Membership no. : \_\_\_\_\_  
Expiry Date : \_\_\_\_\_

## Student Enrolment Annual Subscription (Inclusive of 7% GST)

- 2000 & Above \$642.00
- Below 2000 \$535.00

(Please tick appropriate box)

## Associate Membership

- New Applicant
- Membership Renewal  
Current Membership no. : \_\_\_\_\_  
Expiry Date : \_\_\_\_\_

The annual subscription fee is \$1,070.00. (Inclusive of 7% GST)

*\*A joining fee of \$25 applies. However the joining fee will be waived if renewal is made before the membership expiry date.*

## Particulars (Please print)

Name of School: \_\_\_\_\_

Address: \_\_\_\_\_ Singapore ( \_\_\_\_\_ )

Name of Principal: \_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_

School Email Address: \_\_\_\_\_

## Mode of Payment

- By Cheque (Please make cheque payable to **SCIENCE CENTRE BOARD**)
- Require an invoice from **Science Centre**

\_\_\_\_\_  
Signature of Principal                      School Stamp                      Date

Please return this form to:  
Science Centre Singapore  
15 Science Centre Road  
Singapore 609081  
FAX: 6565 9533 or 6561 6361

### For Official Use:

_____	_____	_____	_____	_____	_____	<b>Joining Fee</b>
MID	Date of Enrolment	Date of Expiry	Date Received	Processed by		Yes <input type="checkbox"/>
						No <input type="checkbox"/>

## Exhibition Learning Resources

Exhibitions are the principal means used by the Science Centre to promote interest in science and technology among the general public and students. Most of the exhibition themes in the various galleries are related to the science syllabi of schools, and the exhibits serve as excellent materials for complementing science teaching in schools. The interactive exhibits provide students with opportunities for open-ended exploration and experimentation.

To complement the exhibits in the exhibition, exhibition learning programmes called '**Gallery Pathways**' have been developed to make learning more interesting. The gallery pathways are designed to guide students as they learn how to better visualise abstract ideas such as force, infection and transmission of infections, genetics, nanotechnology, environmental impact etc.

### Information On Our Exhibitions

#### *Climate Change*

What does it mean when we say our climate is changing? Does climate usually undergo cycles of change? How can we relate present global warming to past changes in climate? **The Climate Change Exhibition** explores these questions as well as the causes of this century's warming.

#### Highlights of the exhibition:

##### **Sub Zero**

Your journey of discovery begins as you step into a polar research station (diorama) at the entrance of an icy world. Here, you can gain insights to ongoing research at the Polar Regions, the 'frontlines' of climate change. Learn about past climate and climate influencing events such as El Nino as you make your way through Sub Zero.

##### **Climate Flux**

It's all about weather and climate in this section of the exhibition. Explore the differences between Weather and Climate through a shadow puppet play. Learn about the various layers of earth's atmosphere and the 'ingredients' of weather. Feel the difference between Natural and Amplified Warming and see the Carbon Cycle in action.

##### **Climate Impacts**

Discover the impacts of climate change and its effects on agriculture, health and ecology. Learn more about eco cities; these developments highlight thoughtful consideration of the environment as the emphasis of these cities is energy efficiency and reliance on clean energy technologies.

##### **Climate Ark**

Find out how you can mitigate climate change by switching to alternative energy technologies and adopting energy efficient practices. Want to make a personal contribution to the environment? Calculate your carbon footprint, then pick up some useful tips which you can apply every day to reduce your footprint and impact on the environment!

##### **ClimEX**

Let us know what you think about climate change. We'd love to hear from you. You may have thoughts on the issues of climate change or even innovative solutions. We encourage you to pen these down at the exhibition.





## Discovery Zone



This hands-on children's science exhibition is designed for children between 4-12 years of age. With its varied and innovative exhibits pitched at various levels of comprehension, Discovery Zone will certainly provide a creative and early introduction to science for the young. The message here is clear: science is extremely exciting and lots of fun. The exhibits are designed to encourage learning through play. The exhibits cover a diverse range of topics to cater to curious minds and to help answer the why's, how's and what's – that are ever present in young inquiring minds.

## Genome



The exhibition explores the human cell structures and functions, and examines the basics of genetics, human history, scientific applications and the impacts on society through interesting settings in which students and the general public can participate in choices to be made, learn more about individual topics from murals, graphics, interactive exhibits, and make informed decisions on specific topics at the end of the exploration.

### Area 1: Basics of Genetics

This area takes visitors through a Clone Zone into the human body, to explore the human cell and the fundamentals of genetics. It draws visitors to see their genetic relationship to other living organisms, to follow a virtual tour of a human cell and witness cell functions, to challenge their own DNA in their speed of duplication, and to test their knowledge on the types of proteins they have inside their own body. Visitors can also explore a protein musical rendition, find out more about genetic traits, and see what traits people would like to have if given a chance to choose. A computer interactive will allow visitors to learn more about genetics.

### Area 2: Applications

This area explores the many applications of genomics. The applications include tracing the migration pattern of Man through the study of Y chromosome and mitochondrial DNA, solving true cases of crime and paternity identity using DNA profiling techniques, understanding the basis of genetic diseases, testing of genes for inherited diseases, fixing mistakes in genes through gene therapy and the potential of therapeutic cloning. Included in this area is the topic on genetically modified organisms (GMOs). Visitors will get a chance to find out the amount of genetically modified foodstuffs on their plate.

### Area 3: Ethics and Views

This area covers a series of video forums on ethical issues such as genetic enhancement, GMOs, and privacy and access, 3 polling stations for visitors to share their views and knowledge of genomics and ethical issues. Thought provoking questions will be posted for visitors to think about as they leave the exhibition area.

### Area 4: All Things DNA – a DNA Boutique Display

This is an area where novelties such as double-helix earrings, necklace, crystal blocks, DNA toys, T-shirts, ties, books and many DNA collector's items are displayed. Some of the items will be available for sale in the Science Centre Shop.

## iSPACE



Being radically different, iSPACE embraces a new approach in offering Infocomm Technology to the visitors of the Science Centre. Instead of being 'topical', the new exhibition will bring visitors on a guided journey through time – exploring the PAST through the first area called **Inspiration**, then to the PRESENT/ NEAR FUTURE. Experience the office, home and leisure of the future using the latest in Infocomm technology. With countless technology

applications built within a diverse range of interactive exhibits in 4 specialty areas, you will be transported into an exciting world of infinite possibilities.

• **Inspiration**

Be enlightened by how visionary science fiction works inspire scientists and technologies.

• **Infocomm Work**

Participate in a videoconference interview and experience the smart office of the future.

• **Infocomm Home**

Experience first-hand smart technologies which will be a big feature of an IT-enabled lifestyle.

• **Imagination**

Think about your own vision of the future

## Living with Viruses



The 'Living with Viruses' exhibition explores the delicate balance of the relationship between viruses, humans and other species that share a common environment. It looks at significant issues related to the causes and control of the worldwide spread of viral infections. This is an exhibition that stimulates the interest of both young and old on the topic of viruses with references made to familiar viral infections that have been a problem in the world today. Throughout the exhibition, selected viral diseases such as **HIV/AIDS, Influenza, SARS, Hand- Foot and Mouth disease, Dengue, Smallpox, Hepatitis, Avian Flu** and **Polio** are featured to illustrate larger issues of viral infection, treatment and prevention.

## Mathematics Everywhere & Everyday



An Exhibition on the wonders and uses of the Mathematics. Mathematics expresses itself everywhere, in almost every facet of life – in the nature around us, and in the technologies in our hands. Mathematics is the language of science and engineering – describing our understanding of all that we observe. So ubiquitous and so important is Mathematics that numeracy is a vitally important and significant, as well as mandatory component of our educational curricula.

The many Mathematics-related exhibitions the Centre has created and hosted, and the interest and excitement they generated, are proof of the attraction and the curiosity Mathematics engenders. To sustain this interest, Science Centre Singapore's new **Mathematics Everywhere & Everyday** Exhibition aims to bring a greater appreciation of the subject, increasing the wonderment and the curiosity of its many fields and applications. This exhibition also aims to achieve the following important educational objectives:

- To excite and amaze students and the public with astonishing, interesting, powerfully and usefully descriptive Mathematics.
- To relate how Mathematics affects our everyday lives when used in many vital applications.
- To instil in every visitor an appreciation and wonder of its scope, and its accessibility as it can be "seen" everywhere, and learned in a variety of ways.
- To point to potential vocation/career opportunities.



## Nanotech

Want to wear a comfortable suit that is waterproof, anti-bacterial, environmentally friendly, stain-resistant, odour-suppressing, more durable, wrinkle-resistant, fire-retardant, antistatic, provides ultra-violet protection,..., and embedded with a supercomputer!?! Nanotechnology promises such marvellous new materials, and much more: from novel techniques in medicine to many other undreamed-of wonders. The Science Centre's Nanotechnology Exhibition is an exhibition that will awe you and also, invite you to consider some of the social-environmental issues this new wonder technology may realise. Hexagonal shapes are present throughout the exhibition area in reference to the hexagonal lattice structure of carbon - carbon atoms in diamond, in graphite (pencil lead), and in new nano-materials like 'buckyballs' and nanotubes. The goal of being able to manipulate atoms and molecules one at a time is already scientifically achieved. But building something macroscopic (human size) from 'the bottom up' by assembling atoms and molecules will still take lifetimes! This is one of the many significant problems nanotechnologists are facing. You can learn (about the difficulties of) how to manipulate atoms and molecules one at a time by playing our ZeroWave exhibit.

*The exhibition leads you through 4 areas:*

### • Basics of Nanotechnology

From its historical development to some of the technical-scientific problems nanoscientists and nanotechnologists have to deal with. Some of these are expressed in artistic renditions and impressions. For example: Fluid Bodies as you enter the exhibition, and the Quantum Tunnel.

### • Current Nanotechnology Research

From the methods required to the types of instruments nanoscientists and nanotechnologists have in their hands. Some pictorial results are expressed in graphically and as artistic impressions. For example: Nano Art showcases results from local laboratories, and the Nano Mandala.

### • Commercialised Nanotechnology Products

From consumer products like tennis rackets to medical paraphernalia to cosmetics. For example: NanoDuck® cloth and Nanosomes®.

### • Issues Nanotechnology May Realise

From possible environmental damage to living up to its incredible promise. For example: Will Nanotechnology produce a DDT-type problem?

## PSLE



The PSLE (Primary Science Learning Environment) is a permanent exhibition based on the topics of the primary school science syllabus. It contains interactive and stationary exhibits that explain scientific concepts in hands-on ways. Although mainly intended to be clarifying and reinforcing (of what is taught in the classroom), the exhibits are also designed to be "open-ended" - to lead to more questions and to guide students through more learning! The principal

mission of the PSLE is to provide exhibits that assist teachers and parents to develop the progressive understanding of the syllabus-mandated scientific concepts in their young charges. Some of these topics presently covered are: **Life Cycles ... Heat ... Temperature ... Magnets ... Magnetism ... States & Properties of Matter... Plant Reproduction & Propagation ... Populations & Communities ... Energy & Energy Conversion ... Forces ... Simple Machines ... many more!**

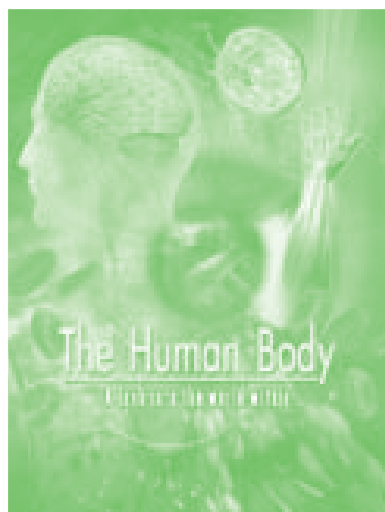
## Sound Exhibition



Sound is all around us. It warns us of danger, helps us navigate, entertains us and most importantly allows us to communicate by expressing ourselves audibly. Discover the surprisingly multifaceted phenomenon of sound as you engage with our range of fun and educationally stimulating exhibits.

Explore the science of sound by learning more about sound waves and how they are transmitted. Test your hearing range and learn how sound travels through your ears via our computer simulations. Find out more about auditory illusions and discover how music enriches our lives. Have fun experimenting with our musical exhibits and bring out the musician in you as you immerse yourself in the world of sound. Come explore the wonders of sound in this interactive exhibition at Hall C.

## The Human Body



The Human Body exhibition is presented in an easy-to-understand manner and is designed for students from the age of 8 to 15 and the general public. It reveals the intricate structures of the human body using large models, interactive exhibits, illustrative graphics, computer interactive programmes and audiovisual presentations. The exhibition is housed on the Mezzanine Floor just above the Web of Life Exhibition. It consists of 4 main areas:

- Your marvellous Senses
- Moving around
- Keeping alive
- A new beginning

## The Mind's Eye

An Exhibition on Optical Illusions that will boggle your mind!

Prepare to be amazed and mesmerised at this exhibition! Occupying 350 sq m at the Science Centre's main entrance lobby, this mind boggling and eye-opening exhibition on optical illusions features 28 highly interactive exhibits and 50 illusion posters that will challenge and tease your senses.



**Unpredictable  
Transformed Faces**



**Seemingly  
Impossible Objects**

## The World of Energy

The Energy exhibition emphasises the importance of energy as well as highlight its relevance to basic science and technology.

The Energy Exhibition is educational, informative and very interactive, and would feature the following areas:

- Energy Fundamental
- Forms of Energy
- Forms of Energy Transfer

In addition, an anchor attraction in a separate area of the Exhibition is the high tension demonstration area known as **"The ThunderBolt!"**. It is poised to be a unique attraction in this region in its own right. Conventional demonstration ideas as well as theatrical techniques such as lightning and soundscaping is employed to provide visitors with a truly exhilarating experience.

## Waterworks – a fun, wet experience with water

Waterworks is an educational, fun and interactive space based on the theme of Water. The 1,000 sq m space is located next to the Science Centre's main entrance and comprises indoor as well as outdoor areas.

Catering to both children and adults, Waterworks aims to educate visitors to the importance of water, a precious resource as well as some of the intriguing facts about water.

Be prepared to get wet as you explore the area and play with the exhibits.

Waterworks features 11 hands-on exhibits. Learn various interesting aspects about water such as the water cycle, evaporation and water pressure.



Highlights of some of the interactive exhibits at Waterworks include:-  
**Water Clock** – Learn about water pressure, rainfall and weather at this 10 m high clock tower complete with various gadgets.

**Water Loop** – Find out about our natural water cycle as well as the purification process in Singapore's local water system.

**Water Maze** – Try to make your way through this 8m x 8m interchangeable maze whose walls are made up of water jets!

**Circular Rainbow** – See a rainbow form right before your eyes in this exhibit!

**Vortex Hoops** – Throw plastic balls into cylinders of water vortices and observe what happens to them.

**Water Saver** – Shoot jets of water into containers and learn about how much water is used in carrying out various daily activities such as brushing one's teeth or bathing.

**Coander Effect** – Find out why a stream of falling water bends when you place a spoon under it.

**Giant Dryer** – Blow dry yourself at the giant dryer stations and learn about evaporation in the process.



## Ecogarden

The Ecogarden is short for ecology garden and was opened in 1983. The plants in this 20,000sq.m area receive no special care (except for occasional pruning, mowing and necessary replanting) and provide an ideal setting for ecological studies with minimum fuss. Essentially it is a living outdoor laboratory.

There are many habitats where animals could find suitable niches for themselves and establish balanced communities. From insects like the caterpillars and dragonflies to common fruit trees; from the vegetable farm to the citrus fruits corner, it's action galore as you witness the dynamic "eat and be eaten" world that inhabits the Ecogarden.

- 8 Pond
- 9 Culinary Garden
- 10 Economic Crops
- 11 Leaf Litter
- 12 Tree House
- 13 Wayside Trees
- 14 Succulent Plants
- 15 Vegetable Beds
- 16 Ecolab
- 1 Healing Plants
- 2 Mini-Rubber Plantation
- 3 Rubber Centenary Monument
- 4 Fernarium
- 5 Wash Room
- 6 Fruit Trees
- 7 Citrus Fruit Trees

### Ecogarden

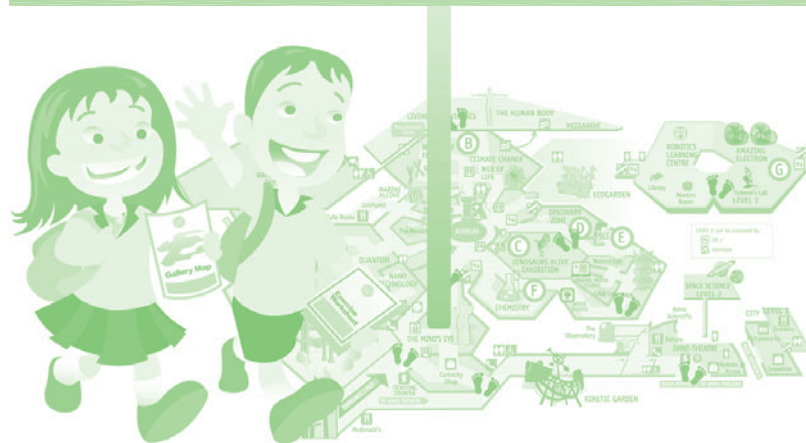
The Ecogarden, short for Ecology Garden, is not an ordinary garden or public park. It is a place unadulterated by the urban environment and is packed with many of nature's secrets to discover. From insects like caterpillars and dragonflies to common fruit trees; from the vegetable farm to the ponds and leaf litter corners, it is action galore as you witness the dynamic "eat and be eaten" world that inhabits the Ecogarden.

Visit the Treehouse, built around a Chinese Banyan and learn about the symbiotic relationship it has with a wasp. The Healing Plants section, featuring over sixty medicinal plants like "Tongkat Ali", Sweet Annie, "Noni" and Neem is also a stop not to be missed. Find out which plants cure your pimples and sore throat. To top it all, many of these medicinal plants can be easily planted in schools.

#### Tour of Ecogarden

This is a self-conducted programme. Worksheets, depending on the level of students will be provided during your visit. The Ecogarden is open from 9.30am to 5.30pm. Student are encouraged to bring along a cap, water bottle and to wear appropriate shoes.

# Gallery Pathway



**Gallery Pathways** have been designed to enhance students' understanding and application of science concepts taught in the primary and secondary school science curriculum. Each Gallery Pathway has been developed as a learning journey as students explore the various exhibitions at the Science Centre. The Gallery Pathway is a self-conducted learning session and teachers are encouraged to book with us in advance before making a visit. Worksheets and answer sheets will be provided to the teacher-in-charge during the visit if bookings are made in advance before the visit. The list of gallery pathways is presented below according to primary and secondary levels.

## **Authentic Problem-Based Learning (APBL) Gallery Pathways**

In line with the emphasis on TLLM (Teach Less Learn More), where the education landscape is shifting from a didactic, teacher-centred to an experiential, student-centred one, Science Centre Singapore is presenting here a suite of problem-based Gallery Pathways to cater to different levels and science topics. In a nutshell, students are presented with a problem which they attempt to research and solve, and where learning takes place in the process. Each pathway comes with 6 accompanying documents/files (as listed below), promising an amazing, self-exploratory journey of scientific learning for each student!

1. Introduction
2. Stimulus (rich variety of formats)
3. APBL programme template
4. Fieldsheet (blank)
5. Post-visit activity (extension activities)
6. Fieldsheet (with answers)

To facilitate your visit to the Science Centre, please inform us by filling up the booking form on page 87 and fax it to us at 65616361. The exhibition galleries are open from 10am to 6pm. We recommend that you spend at least an hour in each exhibition gallery.

## Primary Level

### THE HUMAN BODY

**Topics :** Brain, Senses, Bones, Muscles & Body Systems

**Exhibitions :** Human Body

**Level :** Pri 1 to Pri 6



### THE BRAIN AND THE SENSE ORGANS

**Topics :** Nerves, Sight, Taste, Smell, Touch & Hearing

**Exhibitions :** Human Body

**Level :** Pri 3 & Pri 4



### THE HUMAN BODY SYSTEMS

**Topics :** Muscular, Skeletal, Digestive Circulatory & Respiratory Systems.

**Exhibitions :** Human Body

**Level :** Pri 3 & Pri 4



### ECOGARDEN

**Topics :** Tree Varieties, Culinary Garden, Economic Crops, Plant Varieties & Treehouse

**Exhibitions :** Ecogarden

**Level :** Pri 3 & Pri 4



### FORCES

**Topics :** Power, Magnetic Compass, Mass, Centrifugal Forces, Weight & Gravity

**Exhibitions :** World of Energy, Discovery Zone

**Level :** Pri 5 & Pri 6



### SIMPLE MACHINES

**Topics :** Force, Weight, Pulley, Screw, Gears, Wheel & Axel.

**Exhibitions :** Kinetic Garden, Atrium, Discovery Zone, World of Energy

**Level :** Pri 5 & Pri 6



### PSLE

**Topics :** Gears, Levers & Wedges, Heat & Light, Conversion of Electricity & Pulleys.

**Exhibitions :** PSLE

**Level :** Pri 5 & Pri 6



### LIVING WITH VIRUSES

**Topics :** Understanding HFMD & prevention of Dengue, HIV, Smallpox, Polio, SARS, influenza & Hepatitis.

**Exhibitions :** Living with Viruses

**Level :** Pri 5 & Pri 6







### CLIMATE CHANGE



**Topics :** *Man's Impact on the Environment*

**Exhibitions :** *Climate Change*

**Level :** *Pri 5 & Pri 6*

### THE MIND'S EYE



**Topics :** *Optical Illusions*

**Exhibitions :** *The Mind's Eye*

**Level :** *Pri 5 & Pri 6*

### SOUND



**Topics :** *Waves, Pitch, Human Ear, Echo and Hearing Range.*

**Exhibitions :** *Sound*

**Level :** *Pri 5 & Pri 6*

### MATHEMATICS



**Topics :** *Math concepts, puzzles and applications in life.*

**Exhibitions :** *Mathematics*

**Level :** *Pri 5 & Pri 6*

## Authentic Problem Based Learning (APBL)

### GREETINGS FROM EPSILON



**Topics :** *Sense organs, brain & central nervous system, digestive, skeletal & respiratory systems.*

**Exhibitions :** *Human Body*

**Level :** *Pri 4 to Pri 6*

## Secondary Level

### THE MIND'S EYE

**Topics :** Optical Illusions

**Exhibitions :** The Mind's Eye

**Level :** Sec 1 & Sec 2



### CLIMATE CHANGE

**Topics :** Effects of physical factors & man on ecosystems, greenhouse gases & their consequences

**Exhibitions :** Climate Change

**Level :** Sec 1 to Sec 4



### LIVING WITH VIRUSES

**Topics :** Sexually transmitted diseases & prevention of Dengue, HIV, HFMD, Smallpox, Polio, SARS, Influenza, HIV & Hepatitis

**Exhibitions :** Living with Viruses

**Level :** Sec 1 to Sec 4



### LIGHT

**Topics :** Reflection of light, uses of reflecting surfaces and action of converging lens

**Exhibitions :** World of Energy, Discovery Zone, PSLE, I-Space, Kinetic Garden

**Level :** Sec 1 to Sec 4



### ELECTRICITY

**Topics :** Magnetic effect of current & its applications, principles of electromagnetic induction & production of electrical energy from cells.

**Exhibitions :** World of Energy

**Level :** Sec 1 to Sec 4



### FORCE AND PRESSURE

**Topics :** Examples of forces & their effects, gravitational & magnetic forces

**Exhibitions :** Atrium, World of Energy

**Level :** Sec 1 to Sec 4



### CO-ORDINATION AND RESPONSE

**Topics :** Receptor—the eye, neurons & reflex action

**Exhibitions :** Human Body

**Level :** Sec 3 – Sec 4



## GENETIC DISEASES

**Topics :** Genes, Application of genes in medical biotechnology & Mutation

**Exhibitions :** Genome

**Level :** Sec 3 – Sec 4



## SOUND

**Topics :** Waves, Resonance, Pitch, Human Ear, Echo, Hearing Range, Amplitude of Sound

**Exhibitions :** Sound

**Level :** Sec 1 to Sec 4



## MATHEMATICS

**Topics :** Math concepts, puzzles and applications in life.

**Exhibitions :** Mathematics

**Level :** Sec 1 to Sec 4



## Authentic Problem Based Learning (APBL)

### GREETINGS FROM EPSILON

**Topics :** Sense organs, brain & central nervous system, digestive, skeletal & respiratory systems.

**Exhibitions :** Human Body

**Level :** Sec 1 – Sec 2



### GLOFISH!

**Topics :** Genes, Gene expression, Genetic Engineering & DNA in protein synthesis

**Exhibitions :** Genome

**Level :** Sec 3 to Sec 5



## Physics – Lecture Demo

**Time :** 9.30am or 2.30pm

**Duration :** 1½ h

**Capacity :** 80 min, 200 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Properties of Forces**

What is a force? What can forces do? Join us in learning about the effects of forces and the various types of forces observed in our daily lives. Expect to bring home some interesting knowledge on gravity through a series of fun demonstrations. May the force be with you!

**Topics :** Gravitational force, Magnetic force, Frictional force, Centre of gravity

**Level :** Pri 5 & Pri 6

**Cost :** Free

### **The World of Energy**

We use energy to do work, light up our city, power our vehicles. Everything we do is connected to energy in one form or another. Through this interesting lecture, students can find out how energy works through demonstrations on electricity, heat, light, sound and other forms of energy. Learn about the uses of energy, energy transformation, conservation of energy as well.

**Topics :** Forms of Energy (light, heat, electrical, solar, potential, kinetic, chemical and sound), Energy transformation, Conservation of Energy

**Level :** Pri 5 & Pri 6

**Cost :** Free

### **Electrifying and Energising (I)**

We can't see it, but we can certainly see its effects and impacts. Welcome to the exciting world of electricity, where through demonstrations and explanations, students will better understand the workings of batteries, generators, solar cells and bulbs. There will even be 'hair-raising' demonstrations (Wimshurst machine)!

**Topics :** Electricity, Energy

**Level :** Pri 5 & Pri 6

**Cost :** Free

### **Electrifying and Energising (II)**

We can't see it, but we can certainly see its effects and impacts. Welcome to the exciting world of electricity, where through demonstrations and explanations, students will better understand the workings of batteries, generators, solar cells and bulbs. There will even be 'hair-raising' demonstrations (Wimshurst machine)!  
A more in-depth look at electricity, exploring key concepts such as current, potential difference and resistance will be explored.

**Topics :** Electricity, Energy

**Level :** Sec 1 & Sec 2

**Cost :** Free

### **Adventures with Pressure**

Objects that float, cans that crush seemingly on their own.... All these and more lay in store for participants of 'Adventures with Pressure'. Through a series of interesting and thought provoking demonstrations, the fundamental principles of air and liquid pressure are introduced and discussed. Be amazed by what pressure can do! The lecture can be adapted for all secondary levels.

**Topics :** Force, Pressure

**Level :** Sec 1 to Sec 5

**Cost :** Free

### ***Fascinating Light***

We need light in order to see, but did you know light can be bent, spread out or even slowed down? In this lecture demo, properties of light such as scattering, reflection and refraction will be discussed and demonstrated in a fun and exciting way. Highlights include the use of coloured lights, ultraviolet light, lasers and stroboscopes to demonstrate the properties of light and their various applications.

**Topics** : Light, Energy

**Level** : Sec 1 to Sec 5 **Cost** : Free

### ***Good Vibrations – Exploring Sound***

Experience the world of sound through a series of dynamic and interactive demonstrations. Using musical instruments, props and everyday objects we'll uncover the nature of sound as a form of energy, from its source to its transmission and how it allows us to sense and communicate with the world around us. The lecture will also include references to the newly installed Sound Exhibition, where students can get a hands-on experience of some of the concepts and demonstrations featured during the lecture.

**Topics** : Energy forms, Energy Transfer, Vibrations, Waves, Frequency, Music, Hearing, Senses.

**Level** : Sec 3 to Sec 5 **Cost** : Free

**New!**

### ***High Tension***

For centuries lightning has captivated and bewildered Man. Today, pupils can have an opportunity to learn more about electricity, even very large amount of voltage, in a safe and fun environment. 'High Tensions' is exactly that, a lecture demo covering concepts such as electric charge, electric current, electric field, and electric potential through a series of electrifying demonstrations using Wimshurst machine, gas tubes, Tesla coil and others.

**Topics** : Electricity, Energy

**Level** : Sec 3 to Sec5 **Cost** : Free

## ***Physics – Practical Lab Session***

**Time** : 9.30am or 2.30pm

**Duration** : 2h

**Capacity** : 20 min, 40 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### ***Electric Carnival***

Electricity is very important to us. We use electricity everyday to power all our electrical appliances. This class covers concepts such as parallel and series circuits, electrical connections, identifying electrical conductors and insulators. Students can find out more about the uses of fuse as well as how L.E.D works.

**Topics** : Electricity, Circuit, Conductor, Insulator

**Level** : Pri 5 & Pri 6 **Cost** : Free

**Revised**

### **Heat & Temperature**

Can you use your senses to differentiate between "hot" and "cold"? Find out the various interesting properties of heat and learn how to use the laboratory thermometer. Discover what will happen when objects gain or lose heat. Students will also learn about good and bad conductors of heat

**Topics** : Heat, Temperature, Thermometer

**Level** : Pri 4 to Pri 6

**Cost** : Free

Revised

### **Light**

Explore the nature of light with a series of hands-on activities in this fun-filled workshop. Starting with simple concepts such as "light travels in straight lines", students investigate what effect pinholes, mirrors and lenses have on what we see. The workshop will also touch on aspects of colour, shadow and energy. In addition, information on related exhibits within Science Centre will be provided should you wish your students to explore more on light in our galleries.

**Topics** : Energy forms, reflection, refraction, pinhole cameras, the eye, colours, rainbows

**Level** : Pri 3 & Pri 4

**Cost** : Free

Revised

### **Magnets**

Students will explore magnetism through handling magnets of different shapes. They will also investigate whether certain materials are magnetic, make their own magnets, learn about the properties and uses of magnets and even see the patterns of a magnetic field! If time permits, there will be a brief tour of the exhibits. Are you 'attracted' yet?

**Topics** : Magnetism

**Level** : Pri 3 & Pri 4

**Cost** : Free

Revised

### **All about Sound**

What is sound? How is it produced? What are the physical properties of sound? Discover the science of sound through a series of demonstrations and hands-on activities. Learn to make your own musical instruments and play it together as a mini-orchestra. Be warned, this lesson could be "loud"!

**Topics** : Energy, Waves, Vibrations, Frequency, Pitch, Amplitude, Music

**Level** : Pri 5 & Pri 6

**Cost** : Free

New!

### **From Space Junk to Space Station**

Every year, a staggering amount of funds and resources are used to send rockets and satellites into space for various reasons. Yet, when the satellites are no longer in use, they become "junk". This junk consists of many parts like solar panels, fuel tanks...the list is endless. Imagine what it would be like to recycle all this so called "junk" into space stations in which humans can live and work in. In this workshop, students will get a chance to build their own mini space stations models with materials that may resemble "junk"!

**Topics** : Environmental Science

**Level** : Pri 4 to Pri 6

**Cost** : Free

New!

### **Gravity (I)**

An introductory session in which concepts of forces, gravity and centre of gravity are explored. This lesson adopts a hands-on approach and also encourages students to think about how gravity affects our daily lives in the form of stability, weight, density and mass. In teams, students will build various models and structures to compete against each other, and learn through activities and experimentation. Come and defy gravity!

**Topics** : Forces, Centre of gravity, Stability, Weight, Mass, Density

**Level** : Pri 5 & Pri 6

**Cost** : Free



### **Impact (I)**

How do you protect a falling raw egg from cracking upon impact when it hits the ground? When NASA needs to land their Mars Rover which costs millions to develop, they use, of all things, a nifty parachute! In this lesson, students will be introduced to concepts of free fall, gravity, air resistance and impact. In the process of building and experimentation, aspects of engineering and material science will be incorporated. Expect some elements of materials science. A fun lesson that will engage every student to learn through play and encourage them to think out of the box.

**Topics** : Gravity, Air Resistance

**Level** : Pri 5 & Pri 6

**Cost** : Free



### **Shake, Rattle & Roll (I)**

Build a model structure, resembling a building and subject it to various forces in order to test its stability. This fun, hands-on investigation requires students to think about friction and how to make structures stable by using different materials. Comparison with real-life structures will be highlighted, in particular those able to withstand extreme forces such as earthquakes. This lesson can be adapted to suit a variety of primary levels.

**Topics** : Forces, Materials, Structural engineering

**Level** : Pri 4 to Pri 6

**Cost** : Free

### **Water Rockets (I)**

Looks like water, feels like water, but it is rocket fuel. Do you know that we can store a great deal of energy by compressing air and water in a PET bottle?

In this lesson, students will explore various scientific concepts by constructing a water rocket using various materials and launching it under the supervision of a Science Educator. This lesson can be adapted to suit various primary levels.

Note: Students are advised to bring their own PET bottle for this lesson. (1 bottle for a group of 3-4 students)

**Topics** : Forces, Energy, Balance, Aerodynamics

**Level** : Pri 4 to Pri 6

**Cost** : Free



### **Gravity (II)**

In this lesson, students will gain a deeper understanding of the concept of forces, gravity and centre of gravity taught in schools, through a series of hands-on activities. It also encourages them to think about how gravity affects their daily lives. In teams, students will build various models and structures to compete against each other. This lesson can be adapted to suit various secondary levels.

**Topics** : Forces, Centre of gravity, Stability, Weight, Mass

**Level** : Sec 1 to Sec 4 **Cost** : Free

Revised

### **Impact (II)**

How do you protect a falling raw egg from cracking upon impact when it hits the ground? When NASA needs to land their Mars Rover which costs millions to develop, they use, of all things, a nifty parachute! In this lesson, students will be introduced to concepts of free fall, gravity, air resistance and impact. In the process of building and experimentation, aspects of engineering and material science will be incorporated. Expect some elements of materials science. A fun lesson that will engage every student to learn through play and encourage them to think out of the box.

**Topics** : Gravity, Air Resistance

**Level** : Sec 1 & Sec 2 **Cost** : Free

New!

### **Shake, Rattle & Roll (II)**

Build a model structure, resembling a building and subject it to various forces in order to test its stability. This fun, hands-on investigation requires students to think about friction, centre of gravity and the use of different materials and modify their design based on previous test performance. Comparison with real-life structures will be highlighted, in particular those able to withstand extreme forces such as earthquakes. This lesson can be adapted to suit a variety of secondary levels.

**Topics** : Forces; Newton's laws; Centre of gravity; Materials, Structural engineering

**Level** : Sec 1 to Sec 5 **Cost** : Free

### **Water Rockets (II)**

Looks like water, feels like water, but it is rocket fuel.

Do you know that we can store a great deal of energy by compressing air and water in a PET bottle?

In this lesson, students will explore various scientific concepts by constructing a water rocket using various materials and launching it under the supervision of a Science Educator. This lesson can be adapted to suit various secondary levels.

Note: Students are advised to bring their own PET bottle for this lesson. (1 bottle for a group of 3-4 students)

**Topics** : Forces, Energy, Balance, Aerodynamics

**Level** : Sec 1 to Sec 5 **Cost** : Free

New!



### **Heat Shield**

The scenario: A new spacecraft will be sent to Mars to prepare the way for the first human voyage to the red planet. The spacecraft must survive its journey through space and harsh conditions of entering the Martian atmosphere. In this fun and exciting workshop, teams of students will decide on the best use of their materials in order to build a heat shield that will protect the precious cargo for the longest time against intense heat simulating a spacecraft's fiery entry into an atmosphere.

**Topics** : Effects of heat; Temperature; Materials (Conductors and Insulators), Space technology; Solar system exploration

**Level** : Sec 1 to Sec 5                      **Cost** : Free

### **Nano Lab**

Students will have hands-on experiments to learn about the dominance of intermolecular forces at nano-scale and the importance of the surface area to volume ratio as things get smaller and smaller. What's more, students will even get a chance to create actual nano-structures through a series of interesting chemical reactions! Be a nano-scientist for a day!

**Topics** : Nanoscience, Nanotechnology

**Level** : Sec 1 to Pre-U 2                      **Cost** : Free

## **Chemistry – Lecture Demo**

**Time** : 9.30am or 2.30pm

**Duration** : 1½h

**Capacity** : 80 min, 200 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Chemistry of Toys (I)**

Let the experience of "fun, discovery and creativity " associated with toys continue in this lecture while the students realize themselves that chemistry is an integral part of their everyday experiences. Students will delve into the mysteries of fun toys such as Silly Putty and Magic Jar and find out why "Growing Alligator" expand and reveal the chemistry behind the Cartesian Diver and Love Meter and much more...

**Topics** : Acids, Bases, pH Indicator, Surface tension, Evaporation, Thermochromy, Photochromy, Fluorescence, Phosphorescence (glow-in-the-dark), Polymers

**Level** : Pri 5 & Pri 6                      **Cost** : Free

### **Our Precious Water (I)**

Learn everything about water, from its chemical formula, to the uses of water, its role in living organisms and why water is vital for all life on earth. Understand why water is called the universal solvent, learn more about the 3 states of water, the water cycle and enlighten yourself on some amazing properties of water. Finally, learn about water conservation, how living things adapt to different water conditions and know how Singapore manages its water resources.

**Topics** : Universal Solvent, Density, Freezing Point, Heat Capacity, Vortex, Surface Tension, Role of water in living organisms, Water Conservation, Water in Singapore

**Level** : Pri 5 & Pri 6                      **Cost** : Free

### **States of Matter (I)**

This lecture aims to enhance your understanding of different states of matter – solid, liquid, gas and plasma. You will be shown the physical properties of different states as well as the changes from one state to another through a series of vivid and exciting demonstrations. Certain matters that possess both liquid and solid properties would also be presented.

**Topics** : Crystalline solid, Amorphous solid, Viscosity, Surface tension, Boiling point, Melting point, Ideal Gas, Brownian motion, Plasma, Phase change, Non-Newtonian fluid, Liquid crystals

**Level** : Pri 4 to Pri 6                      **Cost** : Free

### **Amazing Chemistry**

Students will be exposed to a variety of spectacular chemical reactions. Come and experience the fantastic colour changes, puffs, flames, bangs and many more amazing chemistry tricks in this lecture demonstration. Enjoy the intriguing entertainment while the chemistry principals behind the phenomena are revealed.

**Topics** : Exothermic reactions, Catalyst, Acids, Bases, pH indicators, Iodine–Starch reaction, Combustion, Reversible reaction, Redox reaction, Polymers, Precipitation

**Level** : Sec 2 to Pre-U 2                      **Cost** : Free

### **Chemistry of Toys (II)**

Let the experience of “fun, discovery and creativity “ associated with toys continue in this lecture while the students realize themselves that chemistry is an integral part of their everyday experiences. Students will delve into the mysteries of fun toys such as Silly Putty and Magic Jar and find out why “Growing Alligator” expand and reveal the chemistry behind the Cartesian Diver and Love Meter and much more...

**Topics** : Acids, Bases, pH Indicator, Surface tension, Evaporation, Thermochromy, Photochromy, Fluorescence, Phosphorescence (glow-in-the-dark), Polymers

**Level** : Sec 1 & Sec 2                      **Cost** : Free

### **Our Precious Water (II)**

Learn everything about water, from its chemical formula, to the uses of water, its role in living organisms and why water is vital for all life on earth. Understand why water is called the universal solvent, learn more about the 3 states of water, the water cycle and enlighten yourself on some amazing properties of water. Finally, learn about water conservation, how living things adapt to different water conditions and know how Singapore manages its water resources.

**Topics** : Chemical Formula, Density, Freezing Point, Heat Capacity, Vortex, Surface Tension, Role of water in living organisms, Water Conservation, Water in Singapore

**Level** : Sec. 1 & Sec 2                      **Cost** : Free

### **States of Matter (II)**

This lecture aims to enhance your understanding of different states of matter – solid, liquid, gas and plasma. You will be shown the physical properties of different states as well as the changes from one state to another through a series of vivid and exciting demonstrations. Certain matters that possess both liquid and solid properties would also be presented.

**Topics** : Crystalline solid, Amorphous solid, Viscosity, Surface tension, Boiling point, Melting point, Ideal Gas, Brownian motion, Plasma, Phase change, Non-Newtonian fluid, Liquid crystals

**Level** : Sec 1 to Sec 4

**Cost** : Free

## **Chemistry – Practical Lab Session**

**Time** : 9.30am or 2.30pm

**Duration** : 2h

**Capacity** : 20 min, 40 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Chemistry of Food**

Explore the basic concepts of these important nutrients: carbohydrates, fats, proteins and minerals – the chemicals we eat every day. Students will compare the starch content in various foods and be surprised to find out how much fat contained in a small pack of potato chips. They will also extract the elemental iron from breakfast cereal and make glue out of milk!

**Topics** : Carbohydrates, Starch-Iodine reactions, Filtration, Digestion in animals, Acid-Base reaction, Animal nutrition

**Level** : Sec 2 to Sec 4

**Cost** : Free

### **Chemistry of Over-the-Counter Medicines**

Headache! Gastric! Help! Investigate three most widely consumed over-the-counter medications: aspirin, antacids, and vitamin supplements. Discover their chemical properties, reactions in the human body and evaluate their real benefits.

**Topics** : Neutralization Reactions, Iodine-Starch Reaction, Acids, Bases, pH indicators, Reversible reaction, Redox reaction, Identification of ions

**Level** : Sec 2 to Sec 4

**Cost** : Free

### **Chemistry of Soap and Detergents**

This lesson will introduce the students to some of the chemistry that goes into soap and detergents – the chemicals that make you clean. Students will have the hands-on experience to make their own soap. They will also test the various detergent ingredients for their relative efficiency and find out which brand is value for money.

**Topics** : Saponification, Surfactant, Emulsion, Biodegradability, pH, Buffer, Viscosity

**Level** : Sec 4 to Pre-U 2

**Cost** : Free

### ***Chemistry of the Human Body***

Do you know that the human body is really nothing but a bag of thousands of chemicals and chemical reactions? Our growth, our senses and even our intelligence are a result of chemistry. Come and be part of this exciting laboratory session where you carry out experiments to investigate the chemical properties of body fluids and parts such as hair, blood, bone etc. that make up who you are.

**Topics** : Amino acids, Denaturation of Proteins, Protein structure, Identification of ions and gases, Acids, Bases, pH indicators, Precipitation

**Level** : Sec 1 to Sec 4                      **Cost** : Free

### ***Crime Lab***

You will have the opportunity to work with a realistic murder case in a forensic laboratory set-up by using the chemistry. The hands-on activities at the workstations comprise investigations into the following items: fingerprints, shoeprints, blood, hair, soil, fibres, paint chips and pen ink. Are you ready to single out the murderer?

**Topics** : Classification of matter, Classification of plant and animal Life, Paper chromatography, Chemical changes, Precipitation, Microscope

**Level** : Sec 1 & Sec 2                      **Cost** : Free

### ***Crystal Growing***

Learn everything you need to know about crystals through interesting and engaging practical activities. Understand what are crystals, know examples of crystals used in our daily lives and learn about the factors that affect crystal growth. Through hands on activities, learn the three methods of obtaining crystals from a saturated solution and have a closer look at the shape and symmetry of crystals through a magnifying glass. Students would also make models to illustrate the shapes of various crystals. Finally, students would learn how to make Rock Candy from sugar crystals can taste the candy made at the end of the lesson.

**Topics** : Crystallization and Symmetry

**Level** : Sec 1 to Sec 4                      **Cost** : Free

### ***Electroplating Technology***

The process of electroplating is one of the most important applications of electrolysis. You will construct an electroplating device to electroplate copper to the steel rods. Vary the electric current density and different plating solutions to see how the quality of the coating is affected. Try to electroplate non-conductive leaves too – are you up to the challenge?

**Topics** : Reactivity Series, Displacement reaction, Redox reaction, Electrolyte, Electrolysis, Electroplating,

**Level** : Sec 2 to Sec 4                      **Cost** : Free

### ***Perfume Factory***

Perfumes have a long history. The first perfume recorded was nearly 4000 years ago in ancient Egypt! Since then, perfumes have evolved into cutting edge Science, having become indispensable as they are widely used for aromatherapy, for religious ceremonies, or even to mask unpleasant odors such as those from paint, or cleaning materials. In this session, students will explore some of the many methods of perfume making, having fun while they learn about the chemistry behind the fascinating world of fragrances and scents. This session can be adapted for all levels.

**Topics** : Perfumery, mixing and separation techniques & extraction

**Level** : Sec 1 to Sec 4                      **Cost** : Free

### **Chemistry of Cosmetics**

Who says that cosmetics are only for the ladies? They can be for the guys too! In this lesson, you will learn how to make cosmetics such as cold cream, shaving lotion and toothpaste. You will come away clean and clear about the chemistry of cosmetics.

**Topics** : emulsions, oil-miscible, water-miscible, abrasive, humectant, surfactant, acids and bases.

**Level** : Sec 3 to Pre-U 2

**Cost** : Free



## **Mathematics – Lecture Demo**

**Time** : 9.30am or 1pm or 3pm

**Duration** : 1½ h

**Capacity** : 80 min, 200 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **The Mathematics of Chance**

The chances (or probabilities) of winning or losing a game can be calculated and decided upon very rationally. However, our emotions get the better of us and we often make decisions not based on facts. Through a series of interactive demonstrations of some games such as birthday coincide, tossing of the dice, jackpot machine, roulette machine etc, the concept of probability, classifying of data, reading results of outcomes of events, permutation and combinations would be introduced to students

**Topics** : Probability as a measure of chance, probability of single events, Classifying data, Reading results of observations/outcomes of events

**Level** : Sec 1 to Sec 4

**Cost** : Free



## **Mathematics – Practical Lab Session**

**Time** : 9.30am or 2.30pm

**Capacity** : 20 min, 45 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Maths Model Making (I)**

Triangles, rectangles, pentagons, hexagons, octagons and decagons! Oh why are we learning these shapes? This is because geometry is an essential part of our lives. In this activity-based lesson, students will be provided with templates and materials to assemble colourful and amazing 3D mathematical shapes such as the rotating hexagonal ring and the rotating octagonal ring. Be amazed as they transform!

**Topics** : Angles, triangles and polygons, construction of simple geometrical figures, properties of regular pentagon, hexagon, octagon and decagon.

**Level** : Pri 5 & Pri 6

**Cost** : Free

**Duration**: 2h

### **Maths Puzzles and Problem Solving (I)**

Watch as students exercise their thinking, problem solving and creativity skills as they are challenged with interesting activities from the moment they step into the classroom! This is an activity-oriented lesson using puzzles, games and mathematical curiosities. Students will be working in small groups to solve mathematical puzzles where they put into practice their problem solving strategies and skills.

**Topics** : Mathematical thinking and problem solving skill, Logical reasoning, Language and applications of mathematics, Cooperative and independent learning

**Level** : Pri 4 to Pri 6

**Duration:** 2h

**Cost** : Free

### **Mathematics in Games**

Is it possible to make Mathematics exciting and interesting for students? In this fun lesson, students have the opportunity to challenge among themselves and solve the problems through a series of games made of simple materials. Students are divided into small groups and encouraged to solve as many stations as they can within a fixed time.

**Topics** : Problem solving skill, Logical reasoning, Basic Arithmetic and Geometry

**Level** : Pri 5 & Pri 6

**Duration:** 1½h

**Cost** : Free

### **The Fibonacci Sequence & The Golden Ratio (I)**

Attendees are introduced to the Fibonacci Sequence & shapes, & the Golden Ratio in a series of gradual steps. Using examples & slides-pictures, attendees construct the Fibonacci spiral, & make a pair of Golden Ratio calipers. The final activity is an outing to study our outdoors Fibonacci Terrace to relate to lab/class work.

**Topics** : Fibonacci Sequence, Golden Ratio (GR) , GR calipers, natural & man-made occurrence of the Sequence & GR.

**Level** : Pri 5 & Pri 6

**Duration:** 2½h

**Cost** : Free

### **Winning Strategies (I)**

Do you think winning a game is all about chances or is it about strategy? In this lesson, students have the opportunity to explore, strategize and learn the many optimal ways to winning a game.

**Topics** : Problem solving skill, Logical reasoning, Basic Arithmetic, Observation skills

**Level** : Pri 5 & Pri 6

**Duration:** 2h

**Cost** : Free



### **Maths Model Making (II)**

What do a cube, a dodecahedron and an icosahedron have in common? In this activity-based lesson, students will find out that there are only 5 regular polyhedrons called the Platonic Solids. They will be provided with templates and materials to assemble these fundamental 3D mathematical shapes. While exploring the exciting transformation of 2-D to 3-D mathematical shapes, students will appreciate the fact that geometry is an essential part of our daily lives.

**Topics** : Angles, Triangles and polygons, Construction of simple geometrical figures, Properties of regular pentagon, hexagon, octagon and decagon

**Level** : Sec 1 to Sec 3

**Duration:** 2h

**Cost** : Free

### ***Maths Puzzles and Problem Solving (II)***

Watch as students exercise their thinking, problem solving and creativity skills as they are challenged with interesting activities from the moment they step into the classroom! This is an activity-oriented lesson using puzzles, games and mathematical curiosities such as topology and probability. Students will be working in small groups to solve mathematical puzzles where they put into practice their problem solving strategies and skills.

**Topics** : Mathematical thinking and problem solving skill, Logical reasoning, Language and applications of mathematics, Cooperative and independent learning

**Level** : Sec 1 & Sec 2

**Duration:** 2h

**Cost** : Free

### ***The Fibonacci Sequence & The Golden Ratio (II)***

Attendees are introduced to the Fibonacci Sequence & shapes, & the Golden Ratio in a series of gradual steps. Using examples & slides-pictures, attendees construct the Fibonacci spiral, & make a pair of Golden Ratio calipers. The final activity is an outing to study our outdoors Fibonacci Terrace to relate to lab/class work.

**Topics** : Fibonacci Sequence, Golden Ratio (GR) , GR calipers, natural & man-made occurrence of the Sequence & GR.

**Level** : Sec 1 to Sec 3

**Duration:** 2½h

**Cost** : Free

### ***Winning Strategies (II)***

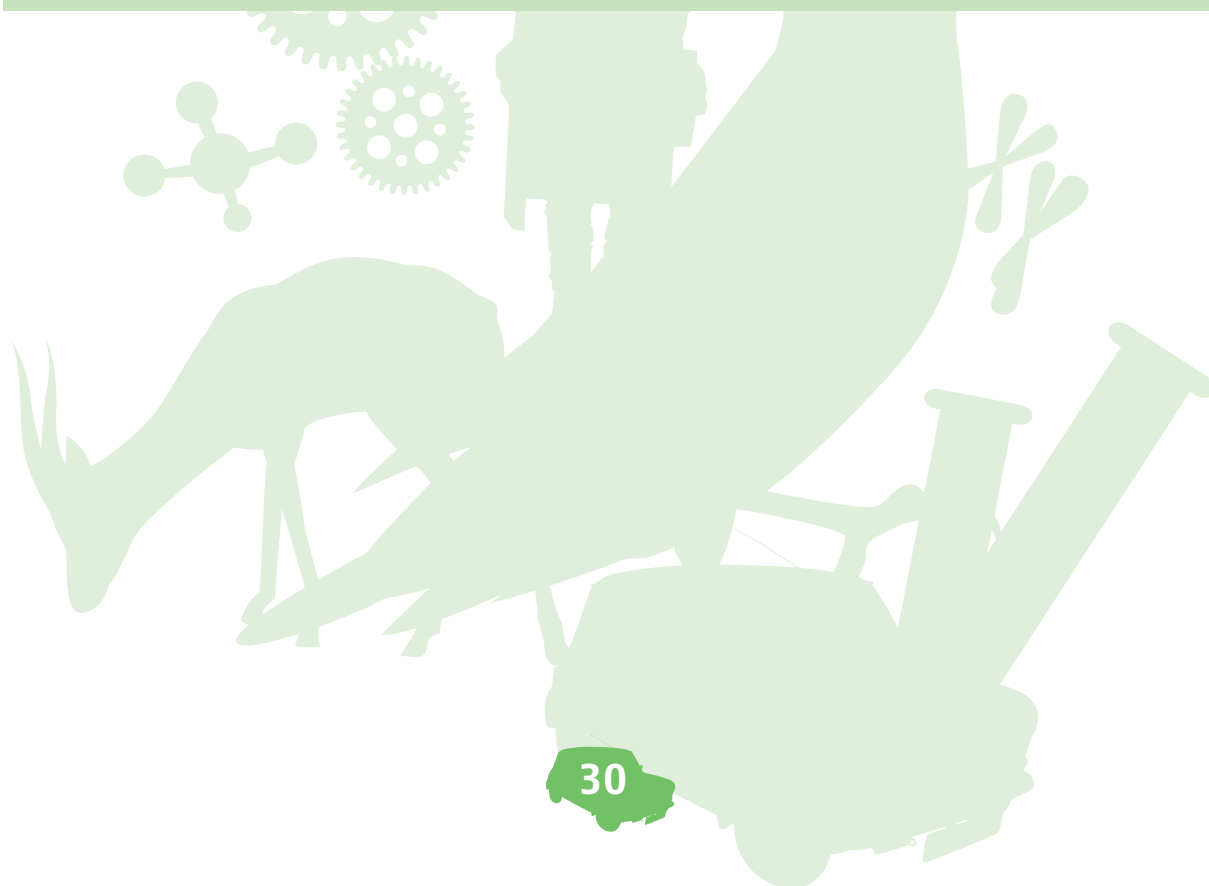
Do you think winning a game is all about chances or strategy? In this lesson, students have the opportunity to explore, strategize and learn the many optimal ways to winning a game. This lesson can be adapted to suit a variety of secondary level.

**Topics** : Problem solving skill, Logical reasoning, Basic Arithmetic, Observation skills

**Level** : Sec 1 & Sec 2

**Duration:** 2h

**Cost** : Free





## Natural Science – Lecture Demo

**Time :** 9.30am or 2.30pm

**Duration :** 1½h

**Capacity :** 40 min, 120 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Food's Long Journey** (include visit to the Human Body Exhibition)

What happens when you eat something? Where does the food go after you swallow? Come explore the journey food takes down a person's digestive system through this lecture demonstration. Pupils will also learn some healthy and nutritious eating tips while understanding more about the human body.

**Topics :** Human systems (The digestive system)

**Level :** Pri 3 & Pri 4

**Cost :** Free



### **My Body** (Include visit to the Human Body Exhibition)

This lecture demonstration allows students to further understand their body functions and parts. A unique introduction to the five senses as well as muscles, heart, blood circulation, respiration and the skeletal system. Volunteers get to participate in some of the demonstrations and pupils get fooled by illusions.

**Topics :** Human system (respiratory and circulatory system, five senses, parts and functions of the body)

**Level :** Pri 5 & Pri 6

**Cost :** Free

### **Our Environment and Us** (include visit to the Climate Change Exhibition)

As an inhabitant of Earth, how many times have we stopped to ask ourselves how our environment is doing at the moment? What has changed from 50 years ago? Everyone has a part to play in protecting our Earth. Come take a closer look at what is happening to our environment and discover what activities are affecting our earth? Students will be introduced to the different kinds of actions that are causing damage to our environment.

**Topics :** Global warming, Climate change, Man's impact on the environment and conservation

**Level :** Pri 5 & Pri 6

**Cost :** Free

### **The Magnificent World of Plants** (include Ecogarden Walk)

The world we live in has many plants with unique characteristics. Learn to differentiate between plants and fungi. Pupils will also learn about the various parts of a plant and their functions, and the many uses in which people use plants: for food, medicines, furniture and much more.

**Topics :** Plant systems (Characteristics of plants, Parts of a plant and their functions), Life cycle of a plant

**Level :** Pri 3 & Pri 4

**Cost :** Free







### **What Goes On Inside a Plant?** (include Ecogarden Walk)

Plants may not seem like much on first glance, appearing to be unmoving masses of green leaves, but that is a misconception. Plants actually contain many wonderful and interesting systems inside them. Come learn more about how plants breathe, "eat" and reproduce!

**Topics** : Cycles in Plants (life cycles, reproduction), Plant system (respiratory and circulatory system), Energy forms and uses (Photosynthesis)

**Level** : Pri 5 & Pri 6

**Cost** : Free



### **Body Systems**

Students will learn in more detail the functions of various systems. Topics include the digestive, circulatory and respiratory systems. Students will also get a chance to observe a sheep heart dissection.

**Topics** : Digestive system, Circulatory system, Respiratory system

**Level** : Sec 1 & Sec 2

**Cost** : Free

## **Natural Science – Practical Lab Session**

**Time** : 9.30am or 2.30pm

**Duration** : 2h

**Capacity** : 20 min, 40 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Aquatic Plants and Animals**

The five ponds in the Ecogarden are teeming with life forms, from microscopic algae to pond skaters and even the occasional water monitor! Pupils will be taught field techniques to catch and observe a variety of aquatic plants (some floating, fully submerged and partially submerged) and animals which make up the pond community. In the process they will learn about relationships between organisms (e.g. food web) in the pond ecosystem.

**Topics** : Interactions, Ecology, Food chain, Food Web, Biodiversity, Conservation

**Level** : Pri 5 & Pri 6

**Cost** : Free

Outdoor session  
(weather permitting)

### **Food From Plants** (include Ecogarden Walk)

Discover how plants make their own food and where they store them. Students will also find out about the different parts of plants that are edible, while making a dish for themselves to enjoy!

**Topics** : Diversity, Plant systems (plant parts and functions), Adaptations, Photosynthesis

**Level** : Pri 3 & Pri 4

**Cost** : Free

weather  
permitting



### **Fun with Animals** (include visit to Discovery Zone, live animal exhibits)

Find out about the physical features of a variety of animals; some with fur, wings, long ears, feathers, gills and more. Students will get a chance to see how earthworms move and also discover many ways of classifying animals.

**Topics** : Diversity, Cycles (life cycles of animals), Adaptations, Locomotion (how animals move)

**Level** : Pri 3 & Pri 4 **Cost** : Free

### **How Fruits and Seeds are Scattered** (Include Ecogarden Walk)

Through observation of various fruit and seed specimens, find out how the various fruits and seeds are scattered. In the process, pupils will be taught how to classify them into various methods of dispersal, such as by water, wind, explosive action and animals.

**Topics** : Seed dispersal, Adaptations, Diversity

**Level** : Pri 5 & Pri 6 **Cost** : Free

weather  
permitting

### **Insect Mysteries** (include Ecogarden Walk)

Insects are the most diverse group of organisms on earth and are vital to the health of our environment. Students get up close and personal with some creepy crawlies and even observe them under the microscope. Discover the many unique and different characteristics and adaptations of insects and learn about their life cycles.

**Topics** : Diversity, Cycles (life cycles of insects), Adaptations

**Level** : Pri 3 & Pri 4 **Cost** : Free

weather  
permitting

### **The Leaf Litter Community**

Investigate the organisms responsible for the decay and breakdown of plant and animal matter in the leaf litter community. This hands-on session will provide an opportunity for pupils to sharpen their skills in finding and observing the animals they catch; from centipedes, earthworms, earwigs to toads. They will be introduced to the recycling of nutrients in nature

**Topics** : Interactions, Decomposition, Decomposers, Energy pathway

**Level** : Pri 5 & Pri 6 **Cost** : Free

weather  
permitting

### **Pond Study**

This is an outdoor study of the plants and animals that make up the pond community. Pupils will be taught field techniques to catch and observe the pond organisms from microscopic algae to flying insects like dragonflies. This session involves the use of microscopes. Pupils will also learn about energy transfer through the food chain and adaptations that make the aquatic organism successful.

**Topics** : Communities, Ecosystems, Energy transfer, Adaptations

**Level** : Sec 1 & Sec 2 **Cost** : Free

Outdoor session  
(weather permitting)

## DNA Learning Lab – Lecture Demo

**Time :** 9.30am or 2.30pm

**Duraton:** 1½ h

**Capacity :** 40 min, 120 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **DNA Talk (DNA the Recipe of Life)**

Just as we need to follow the instructions in a recipe to make a cake, all living things have their own special recipe to maintain and make copies of themselves. That special recipe is contained in our DNA. Learn more about the genetic material responsible for our lives through demonstrations on DNA and cells. This session will also include a learning journey along the Human Body and Genome exhibitions to further explore the topic of DNA in our lives.

**Practicals :** None

**Level :** Pri 4 to Pri 6

**Mode of Delivery :** Talk with demonstrations, models, activities and animations

**Cost :** Free



## DNA Learning Lab – Practical Lab Sessions (Primary)

**Time :** 9.30am or 2.30pm

**Duraton:** 2h

**Capacity :** 10 min, 40 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Diversity of Cells**

Genetics is the basis of the tremendous diversity seen in the world around us. In this session, students will be introduced to the concept of cell diversity. Cells covered include yeast, pond organisms, animal, plant and bacterial cells. Students will be taught to use the microscope to view these cells and identify for themselves the differences between various cells. They will solve a mystery, based on their ability to identify different cells.

**Practicals :** – Microscope viewing  
– Wet-mount slide preparation  
– Simple staining for identification of cells

**Level :** Pri 5 & Pri 6

**Cost :** \$6

### **DNA Basics**

DNA is the blueprint of life and knowing about it gives us great knowledge in the way life works. In this class, students will be introduced to DNA as the most important molecule of life and made aware of the role of DNA in our lives. Students will get a better understanding of the structure of DNA by making a DNA model. They will also be able to see what DNA looks like in real life, by extracting it from bacterial cells.

**Practicals :** – DNA extraction (bacteria)  
– DNA model making

**Level :** Pri 5 & Pri 6

**Cost :** \$6

### **Genes and Our Traits**

Most of our physical traits are determined by the genes we carry. Students are introduced to the concept of genetic inheritance by determining the variation of several genetic traits from parents to offspring. Why is one baby a boy, and another a girl? Why does one child have blue eyes and another, brown eyes? Learning how genes and chromosomal changes are passed down through generations helps students to understand why one person can be affected by a genetic disease, while his parents and another sibling are unaffected.

**Practicals** : -Genetic traits identification exercises  
-DNA extraction (wheat germ) **Level** : Pri 5 & Pri 6

**Cost** : \$6

### **DNA Detectives**

The DNA found in every living cell reveals to us the secrets of life. It leaves fingerprints that can be detected and leads us to solve its mysteries. Students are taken through a forensic investigation and several case studies are created for the students to analyse using DNA as evidence. This simulation where DNA is analysed as evidence in crime investigation introduces students to DNA fingerprinting.

**Practicals** : -Micropipetting techniques  
-Gel-electrophoresis  
-DNA fingerprinting exercises **Level** : Pri 5 & Pri 6

**Cost** : \$6

### **Outbreak!**

Outbreaks of infection are caused by bacteria and viruses that live among us. You will be tracking the outbreak of an infection and assist in the identification of the source. Find out how you can do this and learn more about the control of diseases. You will also learn basic epidemiological techniques through a series of activities that would lead to solving the outbreak.

**Practicals** : - Microscope viewing of bacteria  
- Identification of structures of bacteria **Level** : Pri 5 & Pri 6

**Cost** : \$6

## **DNA Learning Lab – Practical Lab Session (Secondary)**

**Time** : 9.30am or 2.30pm

**Duraton:** 2h

**Capacity** : 10 min, 40 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Cell World**

Cells form the basic unit of life in all organisms. In this session, students will be introduced to the immense diversity in cell structure and function. They will be taught how to use the microscope to view these cells and identify for themselves the differences between various cells. Students will also find out about the relationship between cell function and cell structure. They will apply their knowledge and skills in tackling a case study.

**Practicals** : - Microscope viewing  
- Wet-mount slide preparation  
- Simple staining for identification of cells **Level** : Sec 1 & Sec 2 (Beginner)

**Cost** : \$6

### ***DNA and Life***

DNA, the blueprint of life and knowledge, gives us great understanding in the way life works. In this class, students will be introduced to DNA as the most important molecule of life and will be introduced to the main components of the DNA structure. Students will also get a better understanding of the role of DNA in the application of life science technologies.

**Practicals** : - Hands-on lab techniques  
- Activities on the application of DNA in our lives

**Level** : Sec 1 & Sec 2 (Beginner)

**Cost** : \$6

### ***DNA in Forensic Science***

The DNA found in every living cell reveals to us the secrets of life and leaves 'fingerprints' that can be detected and leads us to solve its mysteries. Students learn about the basics of DNA fingerprinting through a forensic investigation and how to analyse DNA evidence found at the crime scene. Students are also introduced to paternity testing through a simulation of DNA fingerprinting analysis.

**Practicals** : - Micropipetting techniques  
- Case studies on DNA profiling  
- Gel-electrophoresis techniques  
(Actual DNA samples are not used)

**Level** : Sec 1 to Sec 2 (Beginner)

**Cost** : \$6

### ***Bacteria and Health***

The presence of bacteria in our living environment can affect us in many ways. Students will have an understanding of the negative and positive effects of bacteria in our lives. They will also be introduced to the concept of genetic material that can be used to confer antibiotic resistance. Students take on the role of a medical scientist and test the effect of antibiotics on resistant and non-resistant strains of bacteria. They also perform a laboratory test for the identification of bacteria.

**Practicals** : - Sterile and micropipetting techniques  
- Antibiotic resistance test

**Level** : Sec 1 & Sec 2 (Beginner)

**Cost** : \$6

### ***Genetic Diseases***

Genetic diseases are health problems that plague human society. In this class, students will become more acquainted with genetic diseases and learn how the inheritance of genes contributes to genetic diseases. Students will also be introduced to basic genetic concepts of inheritance. They will also get a chance to role-play as genetic counsellors and employ laboratory techniques to address a case study of genetic disease.

**Practicals** : - Genetic diseases case studies  
- Micropipetting techniques  
- Gel electrophoresis techniques

**Level** : Sec 3 to Sec 4/5 (Intermediate)

**Cost** : \$6



## DNA Learning Lab – Practical Lab Session (Pre-University)

**Time :** 9.30am or 2.30pm

**Capacity :** 10 min, 40 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Bacterial Transformation**

Students will learn how recombinant DNA can be used to clone eukaryotic genes in bacteria, thus obtaining mass quantities of a protein product. The gene used, Green Fluorescent Protein (GFP), originated from the bioluminescent jellyfish, *Aequorea Victoria* and has been inserted into a bacterial plasmid using restriction enzymes. Students will transform bacteria via heat shock, and grow the resulting bacteria colonies on agar plates, following sterile lab techniques.

**Practicals :** – Sterile and micropipetting techniques /Plating  
– Bacterial Transformation (Heat-shock method)

**Duration :** 2.5 h

**Level :** Pre-U 1 & Pre-U 2

**Cost :** \$8

### **Proteins: The Machines of Life**

Students are introduced to the various types of proteins in a living cell and their functions in our body. Students would also be guided through the processes involved in protein chromatography. The Green Fluorescent Protein (GFP) is used as a model to study protein function. Students will be able to extract the GFP protein from bacterial cells and view it under UV light.

**Practicals :** – Green fluorescent protein extraction  
– Activities on protein structure and function

**Duration :** 2 h

**Level :** Pre-U 1 & Pre-U 2

**Cost :** \$8

### **Restriction Enzyme Analysis**

Students will learn about the importance of restriction enzymes and their role in analysing DNA. They will have the opportunity to practise techniques used in electrophoresis for DNA separation and analysis. We will introduce students to micropipettes and sterile pipetting techniques. Students will understand the concept of electrophoresis and how it separates a mixture of DNA fragments. They will also learn how to predict a DNA fingerprint using restriction maps. Concepts on restriction enzyme analysis will provide the students with the knowledge of such applications.

**Practicals :** – Micropipetting techniques  
– Preparation of agarose gel and electrophoresis techniques  
– Digestion of DNA with restriction enzymes and DNA analysis

**Mode of Delivery :** Practical lab session (full day workshop)

**Level :** Pre-U 1 & Pre-U 2

**Duration :** 4.5 h

**Time :** 9.30am to 11.30am and 1.30pm to 4.00pm  
(including lunch break- food not provided)

**Cost :** \$12



### **Bioinformatics**

The central theme of our workshop will encourage students to be adventurous in using bioinformatics tools. They will learn how to look up and evaluate biological information online, using various resources and judging the usefulness and reliability of these sources. Using human diseases as case studies for exploration of sequence databases (DNA and protein), students will be introduced to tools like BLAST and CLUSTALX. Bioinformatics' role in understanding evolutionary relationships and visualization of protein structure would also be covered.

**Practicals :**                 - Exploring public databases   - Phylogenetic trees  
                                      - Sequence alignment

**Mode of Delivery :** Practical lab session (full day workshop)

**Level :**                       Pre-U 1 & Pre-U 2   **Duration :** 5 h

**Time :**                       9.30am to 11.30am and 12.30 to 3.30pm   **Cost :**                 \$15  
(including lunch break- food not provided)

### **Polymerase Chain Reaction Workshop**

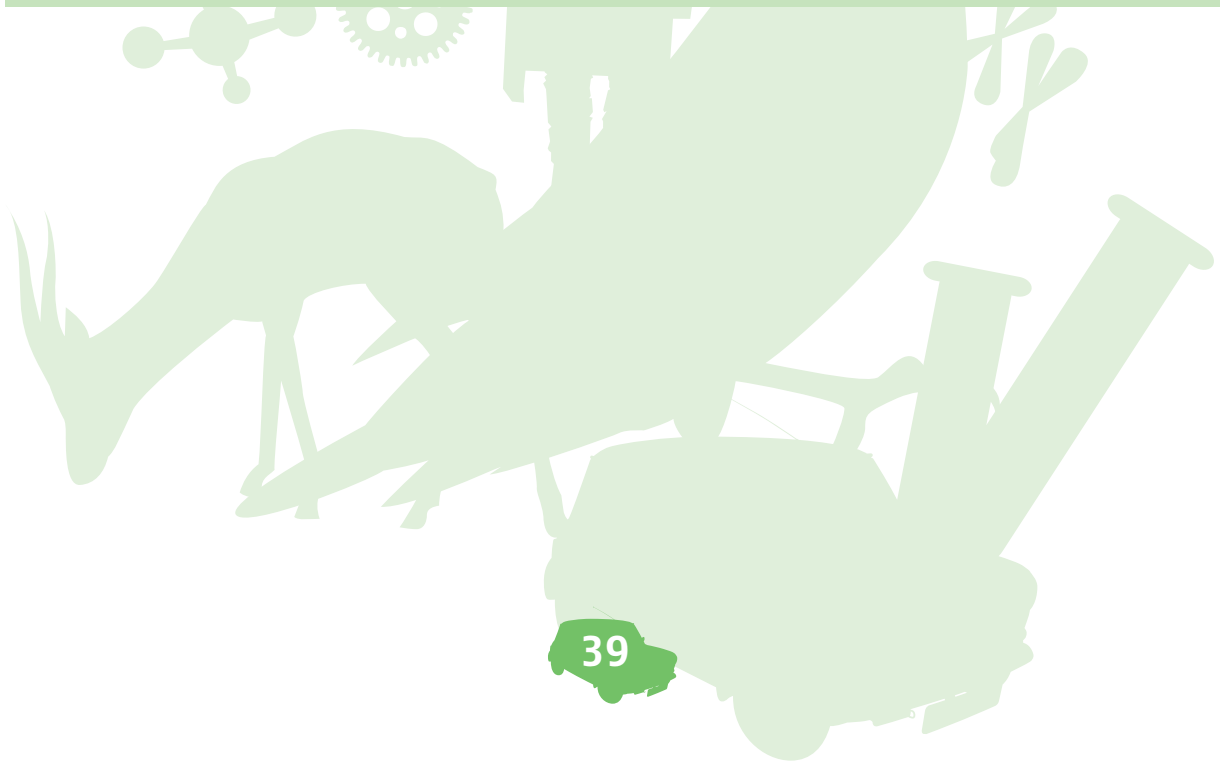
Discover the secrets of DNA and learn about your inheritance through a series of interesting hands-on practicals. Students experience the thrill of being a scientist by working on experiments involving their own DNA. Learn how scientists extract, copy and then analyse human DNA. Training in handling scientific equipment and conducting procedures such as micropipetting, gel electrophoresis and PCR amplification will be provided. Option A: Alu Polymorphism – This workshop examines a human Alu polymorphism at the PV92 locus, caused by a “selfish DNA” element jumping into our DNA within the last several hundred thousand years. Option B: PTC Taste Receptor – Learn more about the genetic basis of taste, and predict if you can taste PTC by analysing your gene for the PTC taste receptor, TAS2R38.

**Practicals :**                 - Micropipetting techniques   - Preparation of agarose gel  
                                      - Polymerase chain reaction   - Gel electrophoresis

**Mode of Delivery :** Practical lab session (full day workshop)

**Level :**                       Pre-U 1 & Pre-U 2   **Duration :** 5 h

**Time :**                       9.30am to 11.30am and 1.30pm to 4.30pm   **Cost :**                 \$20  
(including lunch break- food not provided)





## SEED – based Gallery Learning

**Time :** 9.30am or 10.30am or 2.30pm

**Duration :** 1h

**Capacity :** 20 min, 35 max

**Level :** Pri 1 & Pri 2

*Admission fee to Science Centre applies to Non-Institutional School Members*

### ***In the Garden***

This lesson has been developed to be utilised as part of the SEED programme. Be amazed by the many plants found in our tropical climate. Meet some of the animals that call the Ecogarden home and learn about the plants that provide them with shelter, food and a place to lay their eggs. Visit the Treehouse and even dig around in the leaf litter to find your own earthworm!

**Topics :** Parts of a plant, uses of plants, garden animals, relationship between plants and animals in the garden

**Mode of Delivery:** Outdoor session in the Ecogarden with hands-on activities and worksheets (weather permitting). Instructor/guide provided.

**Cost :** Free

### ***My Senses***

Our understanding of our world comes through the use of our senses but how much do we know about them? Discover the roles and importance of our eyes, nose, mouth, ears, tongue and skin. Through a series of activities in the galleries students find out how their senses help them with daily activities and how senses can be fooled!

**Topics :** Senses, parts of the human body

**Mode of Delivery:** Lesson conducted in the Human Body Exhibition with demonstrations and worksheets. Instructor/guide provided.

**Cost :** Free

### ***The Enormous Watermelon***

In conjunction with the story book, The Enormous Watermelon, pupils will learn science implicitly through the topic of seed dispersal in a fun and interactive way. Be amazed by the wonders that our Ecogarden can provide in terms of its flora. Pupils will have a firsthand experience in seeing the reproduction of plants through the various methods of seed dispersal.

**Topics :** Seed Dispersal

**Mode of Delivery:** Lab lesson and outdoor tour of the Ecogarden (weather permitting). Instructor/guide provided.

**Cost :** Free

### ***The Grasshopper and the Ant***

In conjunction with the STELLAR story book, The Grasshopper and the Ant, pupils will explore the wonderful world of insects. They will be exposed to a wide variety of activities which includes the use of the magnifying glass to observe insects up close. They will also get to experience the world through the eyes of an insect.

**Topics :** Characteristics of insects

**Mode of Delivery:** Lab lesson and outdoor tour of the Ecogarden (weather permitting). Instructor/guide provided.

**Cost :** Free





## ***Kitchen Science – Practical Lab Session***

**Time :** 9.30am or 2.30pm

**Duration :** 2h

**Capacity :** 10 min, 40 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

The Kitchen Lab at the Science Centre builds on students' innate interest in food, within the familiar setting of a kitchen. The programmes explain the science behind many different foods and cooking processes while making links with school curriculum and cater to a range of age groups and abilities. Best of all, the students get a chance to eat their experiments!

### ***Pizza Pizzazz***

Learn to make the popular flat bread with exactly the toppings you want. Pupils learn all about proofing, punching, shaping, baking and enjoying their own creation – a tasty introduction to the science of bread making.

**Topics :** Fermentation (yeast), chemical reactions

**Level :** Pri 5 & Pri 6

**Cost :** \$6

### ***A Jam Session (Making Strawberry Jam)***

Almost everyone loves to eat strawberries but many do not know enough about the fruit and plant. Students will learn about the different parts of a flower, how fertilisation takes place and to compare the three main groups of fruits. At the end, they will get their hands dirty in the process of making strawberry jam. This homemade jam is soft, easy to spread and delicious.

**Topics :** Parts of a flower, Plant fertilisation and Fruit groups

**Level :** Pri 5 & Pri 6

**Cost :** \$6

### ***I Scream for Ice-Cream!***

Participants will learn the processes involved in ice-cream making. They will also be shown how using different types of ingredients effects the final product. Learn what terms such as Emulsifiers and Stabilisers mean and most importantly participants will get to taste the ice-cream that they make.

**Topics :** Physical and chemical reactions involved in making ice cream (Milk Proteins, Sugars, Emulsifiers, Stabilisers), Ice crystals.

**Level :** Pri 5 & Pri 6

**Cost :** \$6

### ***The Science of Making Candy***

Mixing sugar syrup at the right concentration and heating it to the right temperature are crucial to making candy. This process is a delicious art! But it is also a fascinating and precise science. When you are making candy, whether you realise it or not, you are a chemist – transforming matter from one state to another.

**Topics :** Sugar, Saturated solutions, Boiling point

**Level :** Sec 1 & Sec 2

**Cost :** \$6



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**Topics** : Physical and chemical reactions involved in making ice cream (Milk Proteins, Sugars, Emulsifiers, Stabilisers), Ice crystals.

**Level** : Sec 1 & Sec 2                      **Cost** : \$6

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Learn to make the popular flat bread with exactly the toppings you want. Pupils learn all about proofing, punching, shaping, baking and enjoying their own creation – a tasty introduction to the science of bread making.

**Topics** : Fermentation (yeast), chemical reactions

**Level** : Sec 1 & Sec 2                      **Cost** : \$6

### ***Yoghurt Making***

What happens when milk sours? If the conditions are right, it changes into a food that is becoming increasingly popular – yoghurt! Learn the art and science of making yoghurt. See useful bacteria under the microscope and find out some uses of yoghurt in our daily lives. Pick up a few interesting recipes along the way.

**Topics** : Fermentation (milk to yoghurt), bacteria, pH and glucose test, chemistry of milk

**Level** : Sec 3 & Sec 4                      **Cost** : \$6

### ***Chemistry in the Kitchen***

Food, food, glorious food! Eating is a pleasure but do you want to know more about the food you are eating? What are the three main groups and why do we need them? Learn more about carbohydrates, proteins and fats. You will also get the chance to put your culinary skills to practice and make delicious scones.

**Topics** : Carbohydrates, Proteins and Fats

**Level** : Sec 3 & Sec 4                      **Cost** : \$6

### ***Molecular Gastronomy***

Cooking as both science and art, and celebrity chefs have seeped their way into popular culture. People are realizing that by understanding the chemistry behind various cooking methods, we can not only avoid common mistakes, but make food taste so much better. "Molecular gastronomy" is a recent buzzword that has hit food circles. Come learn what is it all about. Pupils will get to make and eat a sodium alginate encapsulation of juices and syrup – a jelly that looks just like caviar!

**Topics** : Carbohydrates (Saccharides), Colloids, Gels, Polymers

**Level** : Sec 3 & Sec 4                      **Cost** : \$6





## Earth & Space Science – Lecture Demo

**Time :** 9.30am or 2.30pm

**Duraton:** 1½ h

**Capacity :** 80 min, 200 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Exploring the Solar System**

Through a series of demonstrations, find out interesting facts about the Sun, planets and their moons and the dwarf planets in the solar system. Learn more about recent space exploration missions. Be amazed by the scale of the solar system and the relative sizes of all the different planets.

**Topics :** Planet characteristics, planet classification, orbits, Space missions

**Level :** Pri 4 to Pri 6

**Cost :** Free

## Earth & Space Science – Practical Lab Session

**Time :** 9.30am or 2.30pm

**Duraton:** 1½ h

**Capacity :** 20 min, 45 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Phases of the Moon and Eclipses**

Ancient legends talk about dragons eating up the moon which results in the different moon 'shapes'. With better technology, man discovered the reason behind the moon phases. Students will learn about Sun–Earth–Moon model, and the different phenomena associated with it (i.e. solar eclipses, lunar eclipses, moon phases).

**Topics :** Phases of the moon, The Sun–Earth–Moon System, Orbits, Light, Shadow, Angles

**Level :** Pri 4 to Pri 6

**Duration:** 1½ h

**Cost :** Free

### **Rambling the Night Sky**

This evening programme features a talk on the basics of stargazing, identification of stars and constellations and our understanding of the night sky.

Weather permitting, there will be an outdoor session where students can view night sky objects through Science Centre's observatory telescopes. Objects commonly seen include the planets Mars, Venus, Saturn and Jupiter, The moon and various star clusters. Not all objects are visible at the same time of year.

**Topics :** Astronomy and stargazing; telescopes; the solar system

**Level :** Pri 3 to Sec 4

**Duration:** 2½ h (7.30pm to 10pm)

**Cost :** Free

### **STARLAB – Planetarium session**

Step inside the STARLAB planetarium, an inflatable dome where students will be given a tour of a virtual night sky. Students will be introduced to several stars and constellations that they identify in the real Singapore sky. The session also features ancient stories and mythology of the constellations as well as activities on Earth's place in space and how Earth's movement influences our view of the sky. The session can be adapted for all primary levels.

**Topics :** Astronomy, seasons, day and night, Ancient Greek mythology/stories

**Level :** Pri 1 to Sec 4

**Cost :** \$6



## ***Introduction to Technology & Creativity workshops***

Welcome to the Technology & Creativity section. For 2010, we have lined up an exciting list of workshops from our 5 learning facilities:

1. Robotics Learning Centre
2. Tinkerers Lab
3. Movie Studio
4. Digital Design Studio
5. Future Media Resource Centre (planned)

Besides our popular workshops, we are introducing several new ones. Look through the list; I am sure you can find something of great learning value.

To better assist you, we have streamlined our workshops into a few Learning Series. With this approach you can better match student interest with teaching enrichment outcomes. The Learning Series are:

### **Robotics Learning Series**

- Junior Robotics (Beginner/Intermediate/Advanced)
- Senior Robotics (Beginner/Intermediate/Advanced)
- Humanoid Robotics or H-Robo (Virtual/Non-Virtual)
- Constructor Robotics or C-Robo

### **Digital Design Learning Series**

- 3D/Stop Motion Animation
- 3D Creature/Worlds Creation/ Visualisation
- Creative Photography and Editing
- E-book (Journal) Publishing

### **Movie Making Learning Series**

- Advanced Filmmaking Techniques
- Movie Effects (Green Screen/Sound)
- Drama (Studio/Green Screen)
- Science Broadcast Journalism
- Special Workshops (e.g., Fun Ads)

### **Tinkerers Learning Series**

- Design and Innovation
- Aeronautics
- Basic Electronics
- Electronics Creativity
- Mechanical Creativity

### **Future Media (e.g., Game Design) Learning Series**

- Junior/Senior Future Medialist

Under each series are Lecture Demos (lessons with demos) and Workshops (lessons with demos and hands-on). Our Movie Studio is relatively new and serves to build on the filmmaking skills of your students. As such, we have advanced subjects like Creative Filming Techniques, Effective Video Storytelling, Studio/Outdoor Lighting, Creative Mobile Phone Filming, Green Screen Techniques, Drama with Green Screen, Creative Photography and Photo Edit, Fun Ads, etc. For enthusiasts, we do have a full filmmaking production suite: Preproduction, Production, and Post production.

You can use many of these workshops to augment your everyday lessons. For example, Drama with Green Screen is full of recreated scenes from Social Studies and Literature. Relive the Hock Lee bus riots or have Juliet stand on the balcony talking to Romeo down below.

With all the different media work these students have done, we would like to encourage them to publish their work. Towards this end we will deploy an e-publishing platform for them to create their "e-journal". It is an e-book that can accept 3D, animation and video images besides the usual text. Students can use this book to log in all that they do at the Science Centre and more.

Many of these courses are new, so do check with us on their availability and pricing. At T&C we are also open to working with you on a case – for example, how to use our programs to better groom the creativity and thinking skills of your students. In this instance we can package a case program catering to special needs at a certain price. An example is "How can my students think like Da Vinci?!" The same goes for our moviemaking modules. Some schools use them to stimulate visual expression.

As a small country with limited resources, our knowledge and imagination play key roles in our economic survival and well-being. At T&C, we teach boys and girls not only how to handle technology, but to be creative and impactful – a balance of the right and left halves of the brain. Once learned they can apply these skills for the rest of their lives.

Many of our courses are also angled towards Science. For example, with Crazy Critters at the DDS, we teach Adaptation Science using a fun creature creation program popular with children. With stop motion, they can learn about physics (Newton's laws), environment (water cycle) and much more.

For teachers, there are workshops to learn about **new digital media, technology** and the latest in **design and innovation** from our in-house experts.

There is more to look forward to at T&C.

In the past year, we have organized talks and engagement events for students and teachers alike. In 2009, we initiated a talk cum film showcase series on documentary filmmaking. We also invited students to our movie studio to engage a well known musician who is also an *avant garde* audio-visual environmental artist. We will certainly do more in 2010 to make your visit to the Science Centre even more meaningful and exciting. Do watch out for such program invites.

For more information, drop us a note or visit our website at:

Email: [enquiries-tnc@science.edu.sg](mailto:enquiries-tnc@science.edu.sg)

Website: [www.science.edu.sg](http://www.science.edu.sg)

Facebook: [www.facebook.com/pages/Science-Centre-Singapore/122610304898](http://www.facebook.com/pages/Science-Centre-Singapore/122610304898)



## Tinkerers' Lab – Lecture Demo

**Time :** 9.30am or 2pm

**Capacity :** 80 min, 200 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### AERONAUTICS SERIES (NEW!)

#### **Take Flight!**

How is it possible for a ton of metal to fly? What did the Wright brothers discover and invent that revolutionised how humans took to the skies?! Learn the history of flight, paper airplane construction and international airflight activities. Other topics include Science Centre's Singapore Amazing Flying Machine Competition and supporting paper airplane workshops. See exciting paper airplane models in incredible action.

**Topics :** Aerodynamics, Paper Airplane Folding Techniques, Avionics History

**Level :** Pri 1 to Sec 4

**Duration :** 1h

**Cost :** Free Trial

New!

### DESIGN & INNOVATION SERIES (NEW!)

#### **Innovations Today**

With this session, students get a snapshot of the latest innovations that are out there in the market today. Innovations that are not only from the consumer industries, but in the other areas of defence, nanotechnology, medicine, aeronautics, interior design, racing, etc...so that students note the many opportunities out there to apply their design and creative thinking skills. Whether the innovations are serious, fun, zany or plain ridiculous, they will see that spaces exist where they can make a contribution or fit their ideas – that the world is not as developed as one thinks. The future is for us to shape.

**Topics :** Innovations, Ideas, Creative Solutions, Gadgets, New Products, etc.

**Level :** Pri 5 to Sec 4

**Duration :** 1½h

**Cost :** Free Trial

New!

## Tinkerers' Lab – Practical Lab Session

**Time :** 9.30am or 2.30pm

**Capacity :** 20 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### AERONAUTICS SERIES (NEW!)

#### **Take Flight!**

How is it possible for a ton of metal to fly? What did the Wright brothers discover and invent that revolutionised how humans took to the skies?! Learn the history of flight, paper airplane construction and international airflight activities. Other topics include Science Centre's Singapore Amazing Flying Machine Competition and supporting paper airplane workshops. See exciting paper airplane models in incredible action. Participants will create and bring home their paper airplane creations.

**Topics :** Aerodynamics, Paper Airplane Folding Techniques, Avionics History, etc.

**Level :** Pri 3 to Sec 4

**Duration :** 1½h

**Cost :** Free Trial

New!

**Extra time slots available :** 10.45 am and 3.45 pm

\*CW4U – Check Website For Updates.

### ***Blast Off!***

What can you build with paper, scissors and masking tape? This fun and enriching workshop will stimulate participants' imagination and creativity as they design and build their own rockets. They will learn about basic rocket engineering concepts. Participants will also have the opportunity to build their own rocket launchers and explore some of the basic principles of projectile motion.

**Topics** : Physics, Energy, Structural Stability, Usage of Tools, Creativity, Problem Solving, etc.

**Level** : Pri 1 to Pri 4                      **Duration** : 2h                      **Cost** : \$8

**Extra time slots available** : 10.45 am and 3.45 pm

## DESIGN & INNOVATION SERIES (NEW!)

### ***I Can Innovate!***

Are creative people a special breed? Certainly there are special talents that live amongst us, but just as in art, anyone can learn to draw. Who knows, the genius in you could be waiting to be discovered. In this lesson, students see how a new idea is formed. They will learn to develop a creative eye so that new ideas will come to mind easily. They can pick up tips on lifelong skills that will help them develop and fine tune creative and innovative ideas. It can help them be effective in more ways than just in Design and Technology. At the end of the lesson, they will apply what they learn to a short design exercise.

**Topics** : Innovations, Inventions, Creativity, New Idea Genesis, 'I Dare Dream' metrics, etc.

**Level** : Pri 5 to Sec 4                      **Duration** : 1½h                      **Cost** : Free Trial

**Extra time slots available** : 10.45 am and 3.45 pm



### ***P.E.N.C.I.L***

The wood encased pencil has been with us since the 16th century. Since then, it has gone through much transformation that is both simple and complex. Through material science, a pencil can now write forever without ever sharpening! To study the pencil is to learn form, design and function. So, it is not a coincidence that this workshop shares the same acronym. It is a creative process. Students will readily 'pencil' out creative ideas in a whole new way.

**Topics** : Innovations, Inventions, Creativity

**Level** : Pri 5 to Sec 4                      **Duration** : 1½h                      **Cost** : Free Trial

**Extra time slots available** : 10.45 am and 3.45 pm



## MECHANICAL CREATIVITY SERIES

### ***Art-in-Motion***

In this hands-on workshop, participants make their own manually operated moving toys using a Cabaret Mechanical Theatre kit and various craft materials. They will create different movements using cams, cranks and shafts – much like parts found in a car. Time to get the kids off electronic games and into some artistic mechanical fun!

**Topics** : Creativity, Physics, Machines, Usage of Tools, Problem Solving, etc.

**Level** : Pri 4 to Sec 4                      **Duration** : 2h                      **Cost** : \$13

\*CW4U – Check Website For Updates.



### **Mouse Trap**

What can you do with a mousetrap besides catching mice? Ever thought how it can be used for other purposes? This fun and innovative workshop allows participants to tinker and discover new and innovative ways to construct mechanisms from a mere mousetrap and a few simple household items. Participants get to bring back the contraptions they build.

**Topics** : Creativity, Physics, Machine, Usage of Tools, Problem Solving, etc.

**Level** : Pri 3 to Sec 4

**Duration** : 2h

**Cost** : \$12

### **Cardboard Automata**

Here, students use cardboard material to design, make their own mechanical art-in-motion contraption. In similar fashion, they will create different movements using cams, cranks and shafts. They will also apply various craft materials. Once more, time to get the kids off electronic games and into some artistic mechanical fun! With cardboard, they can easily replicate their creative work at home and school.

**Topics** : Creativity, Physics, Machines, Usage of Tools, Problem Solving, etc.

**Level** : Pri 3 to Sec 4

**Duration** : 2h

**Cost** : Free Trial



## **ELECTRONICS LEARNING SERIES**

### **NI ELVIS Basic/Intermediate/Advance**

With this advanced but easy-to-use/ all-in-one NI ELVIS electronics learning station, kids will find it easy to understand what makes electronics tick. In a compact table-top form factor, they have at their disposal a voltage generator, signal generator, multimeter, and even a software oscilloscope to capture and see various types of electronic waveforms. With this learning kit, students can learn basic electronics to advanced circuit setups.

**Topics** : Electronics Circuit Building and Analysis, etc.

**Level** : Pri 5 to Sec 4 (strongly recommended for keen hobbyists)

**Duration** : 3h

**Cost** : Free Trial

**Extra time slots available** : 10.45 am and 3.45 pm

\*CW4U – Check Website For Updates.

## MOVIE EFFECTS SERIES

### **Sound Explorer 1 – Sound Engineer**

This workshop allows participants to exercise imagination and creativity to tinker with all sorts of materials like paper plates, beans, wooden planks, poles, cardboard, etc., to build their own 'musical machine'. Through this exciting hands-on activity, participants will discover the artistic side of physics and mechanics. (This is an enhanced course of the previous Sound Automata.)

**Topics** : Creativity, Physics, Machine, Usage of Tools, Problem Solving

**Level** : Pri 3 to Sec 4                      **Duration** : 2h                      **Cost** : \$10

### **Sound Explorer 2 – Movie Sound Effects**

In the movie business, the foley engineer is the one who creates all the sounds that appear on screen. Learn some techniques that the FE uses. Do you want to simulate rain? Thunder? Or even a rooster crowing (To bring back the old kampong days)

**Topics** : Sound Engineering, Percussion, Sound Material Crafting, etc.

**Level** : Pri 3 to Sec 4                      **Duration** : 1½h                      **Cost** : \$6

**Extra time slots available** : 10.45 am and 3.45 pm



## **Digital Design – Practical Lab Sessions**

**Time** : 9 am or 2 pm

**Capacity** : 40 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

## 3D VISUALISATION SERIES

### **My 3D Rainbow Fish!**

Expose your child to his/her first computer 3D painting experience! In a rich and intuitive environment, children are introduced to simple animation controls that animate characters (in this case a fish). They manipulate and paint while learning more about the body parts of a fish. At the end of the session, they will get to see their fishes swim in a class tank! This workshop is appropriate for preschool to primary 4 students and it serves as a beginning step into the realm of digital animation.

**Topics** : Parts of a Fish, Animation Controls, Rich 3D Texturing, etc.

**Level** : K2 to Pri 4                      **Duration** : 1½h                      **Cost** : \$20

**Extra time slots available** : 10.45 am and 3.45 pm

\*CW4U – Check Website For Updates.

### ***Crazy Critters***

Here children learn the exciting ways creatures adapt to their surroundings – from the common stick insect to the unique finless shark deep under the ocean. They also learn how these creatures adjust to survive in very harsh environments: the very cold desert to the very hot thermal vents undersea (400 degrees Celsius; crazy!). At the end, they try their hand at creating their own creature based on environmental factors. The creature creation program at our DDS is extremely intuitive and easy to use. Children will have hours of fun designing their adapted creature.

**Topics** : Adaptation, Animation, SPORE Program Use, etc.

**Level** : Pri 3 to Sec 2

**Duration** : 1½h

**Cost** : Free Trial



**Extra time slots available** : 10.45 am and 3.45 pm

### ***My First e-Journal***

E-books are all the rage these days. But what about a book that lets you view popular media such as video and animation as well. A book that comes alive than mere words can. A book to better showcase all the activities you have taken part in, be it a science experiment or field trip. In other words, an e-journal you can view, update, and share with your friends. Using the popular KooBits e-publishing tool, students can easily learn to create and update their very own e-journal. The e-journal is a fun way to document their science and technology learning journeys through Science Centre Singapore – or even their years in school.

**Topics** : KooBits, Creative Publishing Ideas, Communication Skills, Journal Keeping, etc.

**Level** : Pri 3 to Sec 2

**Duration** : 1½h

**Cost** : Free Trial



## **3D ANIMATION SERIES**

### ***Stop Motion Animation (Story example: Water Cycle)***

Ever wondered how Wallace and Gromit or Pingu the Penguin were created? In this workshop, participants step into the creative world of stop-motion animation by creating their own animation based on a science topic such as The Water Cycle. They will learn water conservation in a unique way! Other topics can be realised.

**Topics** : Water Cycle, Stop Motion Animation, Water Scarcity, etc

**Level** : Pri 4 to Sec 2 (Content varies for Primary and Secondary school levels)

**Duration** : 2h

**Cost** : \$22

### ***Digital 3D Comic Strip (Story example: Overfishing)***

Ever have a chance to create your own digital 3D comic strip and become a better storyteller at the same time? Indulge in this fun 3D toons workshop! Participants will learn the impact of overfishing and create the message they would like to tell through storyboarding. With their storyboards, they can proceed to create their own digital 3D scene and comic strip.

**Topics** : Overfishing Impact, Storyboarding, Animation Controls, Timeline Planning, etc.

**Level** : Pri 5 to Sec 4

**Duration** : 3h

**Cost** : \$23

\*CW4U – Check Website For Updates.

## GAME DESIGN SERIES (NEW!)

### **Scratch Master**

Itching to teach your student game design? Using the Scratch program designed by MIT, students can easily learn game programming using a 'tab' plug & play approach. They can play around with variables such as time and sound files. MIT Scratch is a very popular game design learning platform that has a wide community in the world. Begin and join the community starting at the Science Centre T&C Digital Design Studio.

**Topics** : Games Design, MIT Scratch Programming, Game Play, etc.

**Level** : Pri 3 to Pri 4

**Duration** : 3h

**Cost** : Free Trial

### **Inside Games 1 – Math**

In role-playing and situational games, Math plays an important role. Besides the updating of factor numbers (e.g., army strength still left) there are other considerations like cost, defense, speed and many other statistics. As gameplay gets bigger and more involved (like RPG game Final Fantasy), a huge database of stats develop: monster stats, player stats, level progression charts, combat formulas and so on. Evidently, game designers use Math to control many aspects of gameplay – math such as the kind kids learn in secondary school like calculus, linear algebra, probability, etc.

**Topics** : Math & You, Game Types, Game Math, etc.

**Level** : Sec 1 to Sec 4

**Duration** : 1½ h

**Cost** : Free Trial



### **Inside Games 2 – Gameplay**

Role-playing games are as popular as ever and growing. Although many kids play (and quite a number do want to design their own games), few know the nuts and bolts of it. For example, how is a character incentivized in a game? How is the experience of the character managed by the game engine? Are there tools to help a game designer decide? Knowing how a game works is not only fun, but it also adds to a more rewarding and richer gaming experience. There's also a lot of science in it: Psychology, Decision-Making, Statistics, Modeling, etc.

**Topics** : Popular Games, Gameplay Management, Gameplay decision-making, etc.

**Level** : Sec 1 to Sec 4

**Duration** : 1½ h

**Cost** : Free Trial



## **Movie Studio – Lecture Demos**

**Time** : 9am or 2pm

**Capacity** : 80 min, 200 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

## SCIENCE BROADCAST JOURNALISM SERIES (NEW!)

### **Studio & Outdoor Reporting**

Got a bit of science news to report? Learn what science reporting is all about, the communication skills required as well as what makes a good science story. Students will be taught how it is done in a studio as well as outdoors and the accompanying production challenges.

**Topics** : "Live" Linear Editing, News Worthiness, TV Writing, Sound Bites, Filming, Journalistic Integrity, etc.

**Level** : Pri 4 to Tertiary

**Duration** : 1½h

**Cost** : Free Trial

\*CW4U – Check Website For Updates.

## Movie Studio – Practical Lab Session

**Time :** 9am or 2pm

**Capacity :** 20 maximum

*Admission fee to Science Centre applies to Non-Institutional School Members*

### **Experience Green Screen Filming**

Ever wonder how actors in movies fly and fall from great heights? Or travel to seemingly impossible places? Well, it is mostly the use of Green Screen technology. Ok, some folks use a blue screen, but the idea is the same. Have your students experience what it is like to be in a studio equipped with Green Screen special effects technology. Who knows... he/she might be inspired to start a filming career!

**Topics :** Green Screen, Backdrop, Movie Making, Transposing, etc.

**Level :** Pri 1 to Tertiary

**Duration :** 1h

**Cost :** Free Trial

New!

**Extra time slots available:** 10.45 am and 3.45 pm

### **Pre-production workshop – Storyboarding**

What makes a good movie? Many things. The story behind the scene is one. In this workshop, participants have a go at storyboarding, scripting a good story, and transforming it into moving pictures. This workshop is appropriate for students from Primary 5 to Tertiary.

**Topics :** Storyboarding, Scripting, Acting, etc.

**Level :** Pri 5 to Tertiary

**Duration :** 3h

**Cost :** Free Trial

New!

### **Production workshop – Filming with Green Screen**

Ever wonder how many crew members are involved in the production of a movie? There are directors, producers, actors, light & sound specialists... Yes, there are many roles and they each play an important part in making the movie a success. Participants in this workshop will experience all activities that go into filming a movie.

**Topics :** Lights, Camera, Chroma Key, Acting, etc.

**Level :** Pri 5 to Tertiary

**Duration :** 3h

**Cost :** Free Trial

New!

### **Post-production workshop – Editing**

Editing is often referred to as the "invisible art" in moviemaking. It can be so well executed that the viewer becomes engrossed with the show itself and not be aware of the laborious work behind it all. Participants for this workshop will practice splicing two or more shots together to form a film sequence. Then connect film sequences to form an entire movie.

**Topics :** Movie Editing, etc.

**Level :** Pri 5 to Tertiary

**Duration :** 3h

**Cost :** Free Trial

New!

\*CW4U – Check Website For Updates.

### ***Creative Filming Techniques***

What makes a good story great, a compelling story irresistible? Here you'll learn the techniques to tell a great video story; – which angle to shoot, which framing technique to use, etc., and how to get the most from your edits. We cannot promise you a golden statuette but you'll impress a few people along the way.

**Topics** : Camera Angles, Camera Shots, Framing, Editing, etc.

**Level** : Pri 5 to Sec 4

**Duration** : 3h

**Cost** : Free Trial

**New!**

### ***Effective Video Storytelling***

Almost anyone can tell a story. But only a few can tell it compellingly. What makes a good story? Learn this and other techniques to tell your story in a way that will capture the imagination. Whether the medium is video or 3D animation, by applying these techniques your stories will never be boring again!

**Topics** : Plot Devices, Camera Angles, Storyboarding, etc

**Level** : Pri 4 to Sec 4

**Duration** : 1½h

**Cost** : Free Trial

**New!**

### ***Green Screen Techniques***

A movie these days cannot escape from a special effect or two. And actors are increasingly finding themselves acting in front of a green screen. How is a green screen set up? How can I use a green screen in my video? Or how can I use a green screen to tell my story a little differently?

**Topics** : History and Techniques of Chroma Keying, etc

**Level** : Pri 4 to Tertiary

**Duration** : 1½h

**Cost** : Free Trial

### ***Drama with Green Screen***

We are all well acquainted with doing drama on a stage. But what if you have the chance to do drama in a studio, one with lights, camera equipment? A green screen? Yes. More and more productions are using a 'virtual set'. In this advanced studio environment, the virtues are many and your audience will literally see your productions in a whole new light.

**Topics** : Science and Application of Chroma Keying, Drama Considerations, etc.

**Level** : Pri 4 to Sec 2

**Duration** : 1½h

**Cost** : Free Trial

**New!**

### ***Video Lighting – Studio & Outdoors***

A good video story can be let down by poor lighting techniques. Learn the elements of studio and outdoor lighting. This will ensure that no matter your video subject, it will feature well in your film.

**Topics** : 3-Point Lighting Techniques, Lighting Equipment, Safety, etc.

**Level** : Pri 4 to Sec 4

**Duration** : 3h

**Cost** : Free Trial

**New!**

\*CW4U – Check Website For Updates.

### ***Creative Mobile Phone Filming***

Advanced mobile phone technology has certainly allowed many of us to make a video anytime, anywhere. But the quality of these videos has remained that of a home video with camera shakes, poor framing and even incoherent story-telling. With proper techniques, a mobile phone video recorder can be as effective as a camcorder. The videos you upload to a blog or video sharing site will impress rather than turn people away.

**Topics** : Latest Handphone Camera Technologies, Camera Angles, Filming Techniques, Accessories, etc.

**Level** : Pri 4 to Pri 6

**Duration** : 1½h

**Cost** : Free Trial

**New!**

### ***Creative Photography***

What constitutes a great picture? Or how can I simply take a decent picture always? Here, these questions are answered, as well as picking up on techniques to carry out creative photography. Interested in Nature or Science Photography? One-time workshop, life-time skills.

**Topics** : Framing, Composition, Flash, Creativity, Subject Study, Picture Analysis, etc.

**Level** : Pri 4 to Tertiary

**Duration** : 3h

**Cost** : Free Trial

**New!**

### ***Creative Photo Edits***

In recent years, the advent of digital photography has spawned another activity: Photoshopping – in other words, photo-editing. In this workshop, students will learn the common advanced techniques professionals use to manipulate an image in a fun and useful way.

**Topics** : Image Sizing, Color Correction, Layers, Path Conversions, Masking, etc.

**Level** : Pri 4 to Tertiary

**Duration** : 3h

**Cost** : Free Trial

**New!**

### ***Fun Ads***

Create an impactful but fun commercial at our movie studio or digital design studio. Do it on film, camera or stop-motion animation. Your message, your imagination and your product (or service) to sell – in a funny way. Tickle our bones.

**Topics** : Unique Selling Points, Video Humour/Gags, Sound Bites, Comic Timing, etc.

**Level** : Pri 4 to Tertiary

**Duration** : 3h

**Cost** : Free Trial

**New!**

\*CW4U – Check Website For Updates.

## Junior Robotics – Practical Lab Session

**Time :** 9 am or 10.45 am or 2 pm or 3.45 pm

**Capacity :** 20 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### JUNIOR ROBOTICS – BEGINNERS

#### **Mission Mars**

Based on the theme of space mission on planet Mars, this workshop provides a fun, exciting and enriching learning experience using the LEGO MINDSTORMS RCX platform. In this hands-on workshop, participants will pick up basic concepts of robotics, programming and problem-solving skills.

**Topics :** Basic Robotics, Simple Machines, Programming, Logical Thinking, Problem Solving, etc

**Level :** Pri 1 to Pri 6

**Duration :** 1½h

**Cost :** \$7

#### **RoboSports**

This unique sports-based workshop is fun & exciting. Participants will work in teams to programme a LEGO MINDSTORMS RCX robot to get the balls into the designated goal areas. Participants will pick up basic concepts of robotics and programming, as well as acquire problem-solving skills.

**Topics :** Basic Robotics, Simple Machines, Programming, Logical Thinking, Problem Solving, etc.

**Level :** Pri 1 to Pri 6

**Duration :** 1½h

**Cost :** \$7

#### **Dr Heartbeat & the NXT-bots 1**

Dr Heartbeat is a medical scientist who uses state-of-the-art robots to help his patients. Participants of this workshop will become Dr Heartbeat's medical students. In Phase 1 of the NXT-bot testing, participants will embark on an exciting journey to test how well these NXT-bots can perform anesthetic injections, remove bad cells, repair broken veins and even respond to a heart attack. A great taster workshop for those without prior knowledge of the LEGO MINDSTORMS NXT platform or those who simply want to have fun with the NXT-bots!

**Topics :** Basic Robotics, Simple Machines, Programming, Logical Thinking, Problem Solving, etc.

**Level :** Pri 2 to Pri 6

**Duration :** 1½h

**Cost :** \$9

#### **Dr Heartbeat & the NXT-bots 2**

Following the successful Phase 1 testing, Dr Heartbeat and his medical students will now attempt to expand their NXT-bots' abilities. In order to enhance precision control of the robots, participants will further explore NXT-bots' sensor capabilities and programming functions. Another great taster workshop for the LEGO NXT platform, especially for those intending to proceed to the I-NXT modules or those who simply just want to have fun with the NXT-bots!

**Topics :** Basic Robotics, Simple Machines, Programming, Logical Thinking, Problem Solving, etc.

**Level :** Pri 3 to Pri 6

**Duration :** 1½h

**Cost :** \$10

\*CW4U – Check Website For Updates.



## JUNIOR ROBOTICS – INTERMEDIATE

### ***I–Robotics Module 1 – Build & Stack***

In the first of a series of modules, participants will be introduced to the various parts of the LEGO MINDSTORMS set. With that knowledge, they will experiment to begin to build their first basic robot.

**Topics** : Basic Robotics, Simple Machines, Basic Building Blocks of LEGO MINDSTORMS, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$10

### ***I–Robotics Module 2 – Command & Control***

In this module, participants will be introduced to the use of RoboLab programming software. Useful hands-on exercises will help participants capture basic programming techniques. They will then programme the basic robots built in Module 1 to perform simple tasks.

**Topics** : Basic Robotics, Logical Thinking, Basic Programming Concepts, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$10

### ***I–Robotics Module 3 – Geared Up!***

Here, participants will discover more types of gears in the LEGO MINDSTORM set (e.g. bevel gear, rack gear and even worm gear). They will learn what concepts of “gearing up” or “gearing down” and a lot more besides. Participants will observe the rotation of the gears as they build a simple gear models using LEGO parts.

**Topics** : Simple Machines, Gears, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

### ***I–Robotics Module 4 – Lift Off!***

How do pulleys work? What are the different types of pulley system present in our everyday lives? In this module, participants will learn about the principles behind a pulley system and construct a pulley model using the LEGO set. They will experiment lifting up different weights and compete to solve a problem. The strongest pulley model wins!

**Topics** : Simple Machines, Pulleys, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

### ***I–Robotics Module 5 – Sense It! Part 1***

Ever wondered if a robot can “smell”, “touch”, “taste”, “hear” and “see”? Can a robot do all five? Participants will explore a robot’s sensory system and discover how to get it moving using these senses. Participants will understand their practical usage in everyday life. They will also learn advanced programming skills using RoboLab and participate in exercises to test their skills.

**Topics** : Sensors, Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

\*CW4U – Check Website For Updates.

### ***I-Robotics Module 6 – Sensors It! Part 2***

In this continuation of Part 1, participants will explore further the available sensors in the LEGO MINDSTORMS set. Participants will become proficient in using these sensors to complete more advanced challenges.

**Topics** : Sensors, Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 1 – Introduction & Building***

Get an overview of the new LEGO NXT MINDSTORMS set and learn about the basic concepts of robotics. In this hands-on workshop participants will discover the many new features and functions found in this new and exciting robotics system and have fun discovering how to use LEGO bricks to build basic structures of robots.

**Topics** : Basic Robotics, Logical Thinking, Basic Programming Concepts, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 2 – Programming***

This practical hands-on workshop allows participants to programme the NXT robot using the interface software designed for the NXT system. Participants will learn the essential programme functions to command and instruct the robot to perform different tasks using the “Move” instruction block.

**Topics** : Basic Robotics, Logical Thinking, Basic Programming Concepts, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 3a – Touch Sensors***

Sensors act as “fingers” in robots to help them “touch” and “feel” their way around. Participants learn the use of touch sensor in robots through a series of fun and challenging exercises, including programming a robot to “feel” its way through a maze.

**Topics** : Touch Sensor, Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 3b – Ultrasonic Sensors***

What do dolphins, porpoises, bats and whales have in common? They find their way around using a technique called echolocation. This practical hands-on workshop allows participants to discover how the ultrasonic sensor can allow robots to “see” even in total darkness.

**Topics** : Ultrasonic Sensor, Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

\*CW4U – Check Website For Updates.



### ***1-NXT Module 4a – Sound Sensors***

Give a robot a sound sensor and it will be able to "hear". This practical hands-on workshop allows participants to learn how the sound sensor works in robots. They will also learn how to build a robot that can be activated by voice.

**Topics** : Sound Sensor, Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

### ***1-NXT Module 4b – Light Sensors***

This practical hands-on workshop allows participants to discover how robots make use of light sensors. Find out how to make robots differentiate colours and find their way around using the light sensor.

**Topics** : Light Sensor, Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$12

### ***1-NXT Module 5 – Manipulating Data 1***

An introduction to advanced programming for the NXT platform. Learn the cool capabilities of NXT by using a combination of sensors. Explore how data hubs and wiring, multitasking and logic statements affect the NXT's decision-making processes. Through this workshop, participants will learn how to program multiple sensors and apply them in a wide array of applications. (Recommended for students with 1-NXT module Part 1- 4b knowledge.)

**Topics** : NXT Sensors, Data Hubs and Wiring, Multitasking, Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$13

### ***1-NXT Module 6 – Manipulating Data 2***

Continue the journey in discovering more capabilities of the LEGO MINDSTORMS NXT set. Together with different sensors, participants will use the Range, Math and Variable Blocks to display values on the NXT screen itself. Mathematics learned in school can be applied to the NXT robots. Math and Science have never been this much fun! (Recommended for students with 1-NXT module 1-4b knowledge.)

**Topics** : NXT Sensors, Data Hubs and Wiring, Programming, Blocks – Range, Math, Variables, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$13

## **JUNIOR ROBOTICS – ADVANCED**

### ***Advanced Mechanism Part 1 (RCX)***

A robot's parts are designed to fulfill certain functions. Different robots today are designed with different mechanical parts to accomplish a task. In this workshop, students get to construct a gripper mechanism for their robot. Every gripper mechanism has its own unique design and function.

Students will also learn how to programme the mechanism to attempt certain tasks. Part 1 introduces the techniques behind building a gripper with an up-down motion. (Recommended for students with 1-Robotics module 1-6 knowledge)

**Topics** : Simple Machines, Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$9

\*CW4U – Check Website For Updates.

### **Advanced Mechanism Part 2 (RCX)**

In Part 2, participants explore the techniques behind building a gripper that is able to move side-ways. (Recommended for students with I-Robotics module 1-6 knowledge)

**Topics** : Simple Machines, Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$9

### **Advanced Programming Part 1 (RCX)**

In this workshop, students will be given a chance to explore the more advanced features available in RoboLab. In this two-part workshop, they will learn how to use logical thinking to write their own programs to solve different challenges. In Part 1, participants practice the programming technique of conditional statements and multi-tasking. (Recommended for students with I-Robotics module 1-6 knowledge)

**Topics** : Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$9

### **Advanced Programming Part 2 (RCX)**

In Part 2, participants explore the usage of Variables, Timers and Containers and learn how to troubleshoot programmes. (Recommended for students with Advanced Programming Part 1 knowledge.)

**Topics** : Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$9

### **Advanced Sensors Part 1 (RCX)**

Robots rely on many different kinds of sensors, and these may be used in different ways. A good understanding of how to programme a robot's sensors can improve the performance of the robots when attempting different challenges. (Recommended for students with Advanced Programming Part 1 and 2 knowledge.)

**Topics** : Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$9

### **Advanced Sensors Part 2 (RCX)**

In Part 2, participants will continue to explore various advanced techniques such as the input of values of light sensor readings, use of dual light sensor programming and the techniques of using programming sequences to accomplish missions. (Recommended for students with Advanced Sensor Part 1 knowledge.)

**Topics** : Programming, etc.

**Level** : Pri 3 to Pri 6                      **Duration** : 1½h                      **Cost** : \$9

\*CW4U – Check Website For Updates.

## Senior Robotics – Practical Lab Session

**Time :** 9 am or 10.45 am or 2 pm or 3.45 pm

**Capacity :** 20 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

### SENIOR ROBOTICS – BEGINNERS

#### **Mission Mars**

Based on the theme of space mission on planet Mars, this workshop provides a fun, exciting and enriching learning experience using the LEGO MINDSTORMS RCX platform. In this hands-on workshop, participants will pick up basic concepts of robotics and programming and will acquire problem-solving skills.

**Topics :** Basic Robotics, Simple Machines, Programming, Logical Thinking, Problem-Solving, etc.

**Level :** Sec 1 to Sec 4

**Duration :** 1½h

**Cost :** \$7

#### **RoboSports**

This unique sports-based workshop is fun & exciting. Participants will work in teams to programme a RCX robot to get the balls into the designated goal areas. Participants will pick up basic concepts of robotics and programming, as well as acquire problem-solving skills.

**Topics :** Basic Robotics, Simple Machines, Programming, Logical Thinking, Problem Solving, etc.

**Level :** Sec 1 to Sec 4

**Duration :** 1½h

**Cost :** \$7

#### **Dr Heartbeat & the NXT-bots 1**

Dr Heartbeat is a medical scientist who uses state-of-the-art robots to help his patients. Participants of this workshop will become Dr Heartbeat's medical students. In Phase 1 of the NXT-bot testing, participants will embark on an exciting journey to test how well these NXT-bots can perform anesthetic injections, remove bad cells, repair broken veins and even respond to a heart attack. A great taster workshop for those without prior knowledge of the LEGO MINDSTORMS NXT platform or those who simply want to have fun with the NXT-bots!

**Topics :** Basic Robotics, Simple Machines, Programming, Logical Thinking, Problem Solving, etc.

**Level :** Sec 1 to Sec 4

**Duration :** 1½h

**Cost :** \$9

#### **Dr Heartbeat & the NXT-bots 2**

Following the successful Phase 1 testing, Dr Heartbeat and his medical students will now attempt to expand their NXT-bots' abilities. In order to enhance precision control of the robots, participants will further explore NXT-bots' sensor capabilities and programming functions. Another great taster workshop for the LEGO NXT platform, especially for those intending to proceed to the I-NXT modules or those who simply just want to have fun with the NXT-bots!

**Topics :** Basic Robotics, Simple Machines, Programming, Logical Thinking, Problem Solving, etc.

**Level :** Sec 1 to Sec 4

**Duration :** 1½h

**Cost :** \$10

\*CW4U – Check Website For Updates.

## SENIOR ROBOTICS – INTERMEDIATE

### ***I-Robotics Module 1 – Build & Stack***

In the first of a series of modules, participants will be introduced to the various parts of the LEGO MINDSTORMS set. With that knowledge, they will experiment to begin to build their first basic robot.

**Topics** : Basic Robotics, Simple Machines, Basic Building Blocks of LEGO MINDSTORMS, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$10

### ***I-Robotics Module 2 – Command & Control***

In this second module, participants will be introduced to the use of RoboLab programming software. Useful hands-on exercises will help participants capture basic programming techniques. They will then programme the basic robots built in Module 1 to perform simple tasks.

**Topics** : Basic Robotics, Logical Thinking, Basic Programming Concepts, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$10

### ***I-Robotics Module 3 – Geared Up!***

Here, participants will discover more types of gears in the LEGO MINDSTORM set (e.g. bevel gear, rack gear and even worm gear). They will learn what concepts of “gearing up” or “gearing down” and a lot more besides. Participants will observe the rotation of the gears as they build a simple gear models using LEGO parts.

**Topics** : Simple Machines, Gears, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

### ***I-Robotics Module 4 – Lift Off!***

How do pulleys work? What are the different types of pulley system present in our everyday lives? In this module, participants will learn about the principles behind a pulley system and construct a pulley model using the LEGO set. They will experiment lifting up different weights and compete to solve a problem. The strongest pulley model wins!

**Topics** : Simple Machines, Pulleys, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

### ***I-Robotics Module 5 – Sense It! Part 1***

Ever wondered if a robot can “smell”, “touch”, “taste”, “hear” and “see”? Can a robot do all five? Participants will explore a robot’s sensory system and discover how to get it moving using these senses. Participants will understand their practical usage in everyday life. They will also learn advanced programming skills using RoboLab and participate in exercises to test their skills.

**Topics** : Sensors, Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

\*CW4U – Check Website For Updates.

### ***I-Robotics Module 6 – Sensors It! Part 2***

In this continuation of Part 1, participants will explore further the available sensors in the LEGO MINDSTORMS set. Participants will become proficient in using these sensors to complete more advanced challenges.

**Topics** : Sensors, Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 1 – Introduction & Building***

Get an overview of the new LEGO NXT MINDSTORMS set and learn about the basic concepts of robotics. In this hands-on workshop participants will discover the many new features and functions found in this new and exciting robotics system and have fun discovering how to use LEGO bricks to build basic structures of robots.

**Topics** : Basic Robotics, Logical Thinking, Basic Lego Building Concepts, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 2 – Programming***

This practical hands-on workshop allows participants to program the NXT robot using the interface software designed for the NXT system. Participants will learn the essential program functions to command and instruct the robot to perform different tasks using the "Move" instruction block.

**Topics** : Basic Robotics, Logical Thinking, Basic Programming Concepts, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 3a – Touch Sensors***

Sensors act as "fingers" in robots to help them "touch" and "feel" their way around. Participants learn the use of touch sensor in robots through a series of fun and challenging exercises, including programming a robot to "feel" its way through a maze.

**Topics** : Touch Sensor, Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 3b – Ultrasonic Sensors***

What do dolphins, porpoises, bats and whales have in common? They find their way around using the technique called echolocation. This practical hands-on workshop allows participants to discover how the ultrasonic sensor can allow robots to "see" even in total darkness.

**Topics** : Ultrasonic Sensor, Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

\*CW4U – Check Website For Updates.

### ***I-NXT Module 4a – Sound Sensors***

Give a robot a sound sensor and it will be able to "hear". This practical hands-on workshop allows participants to learn how the sound sensor works in robots. They will also learn how to build a robot that can be activated by voice.

**Topics** : Sound Sensor, Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 4b – Light Sensors***

This practical hands-on workshop allows participants to discover how robots make use of light sensors. Find out how to make robots differentiate colours and find their way around using the light sensor.

**Topics** : Light Sensor, Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$12

### ***I-NXT Module 5 – Manipulating Data 1***

An introduction to advanced programming for the NXT platform. Learn the cool capabilities of NXT by using a combination of sensors. Explore how data hubs and wiring, multitasking and logic statements affect the NXT's decision-making processes. Through this workshop, participants will learn how to program multiple sensors and apply them in a wide array of applications. (Recommended for students with I-NXT module 1-4b knowledge.)

**Topics** : NXT Sensors, Data Hubs and Wiring, Multitasking, Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$13

### ***I-NXT Module 6 – Manipulating Data 2***

Continue the journey in discovering more capabilities of the LEGO MINDSTORMS NXT set. Together with different sensors, participants will use the Range, Math and Variable Blocks to display values on the NXT screen itself. Mathematics learned in school can be applied in the NXT robots. Math and Science have never been this much fun! (Recommended for students with I-NXT module 1-4b knowledge.)

**Topics** : NXT Sensors, Data Hubs and Wiring, Programming, Blocks – Range, Math, Variables, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$13

## **SENIOR ROBOTICS – ADVANCED**

### ***Advanced Mechanism Part 1 (RCX)***

A robot's parts are designed to fulfill certain functions. Different robots today are designed with different mechanical parts depending on the tasks they are to complete. In this workshop, students get to construct their own gripper mechanism for their robot. Every gripper mechanism has its own unique design and function. Students will also learn how to programme the mechanism to attempt a task on the mission maps. Part 1 introduces the techniques behind building a gripper with an up-down motion. (Recommended for students with I-Robotics module 1-6 knowledge.)

**Topics** : Simple Machines, Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$9

\*CW4U – Check Website For Updates.



### **Advanced Mechanism Part 2 (RCX)**

In Part 2, participants explore the techniques behind building a gripper that is able to move side-ways. (Recommended for students with I-Robotics module 1-6 knowledge.)

**Topics** : Simple Machines, Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$9

### **Advanced Programming Part 1 (RCX)**

In this workshop, students will be given a chance to explore the more advanced features available in RoboLab. In this two-part workshop, they will learn how to use logical thinking to write their own programs to solve different challenges. In Part 1, participants practice the programming technique of conditional statements and multi-tasking. (Recommended for students with I-Robotics module 1-6 knowledge.)

**Topics** : Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$9

### **Advanced Programming Part 2 (RCX)**

In Part 2, participants explore the usage of Variables, Timers and Containers and learn how to troubleshoot programmes. (Recommended for students with Advanced Programming Part 1 knowledge.)

**Topics** : Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$9

### **Advanced Sensors Part 1 (RCX)**

Robots rely on many different kinds of sensors, and these may be used in different ways. A good understanding of how to programme a robot's sensors can improve the performance of the robots when attempting different challenges. (Recommended for students with Advanced Programming Part 1 and 2 knowledge.)

**Topics** : Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$9

### **Advanced Sensors Part 2 (RCX)**

In Part 2, participants will continue to explore various advanced techniques such as the input of values of light sensor readings, use of dual light sensor programming and the techniques of using programming sequences to accomplish missions. (Recommended for students with Advanced Sensors Part 1 knowledge.)

**Topics** : Programming, etc.

**Level** : Sec 1 to Sec 4                      **Duration** : 1½h                      **Cost** : \$9

\*CW4U – Check Website For Updates.

## ROBOTICS WORLD LEARNING SERIES

### KINDERGARTEN-ROBOTICS SERIES

#### ***K-Robo Master (Different Levels)***

Targeted at the kindergarten child (K1/K2), this series of workshops introduces engineering and mathematical thinking skills to them in a fun and problem-solving way. Sixteen kinds of robots and robotic contraptions can be built. Children learn common technological concepts like IR sensors and DC motors. They also learn programming (easily done with scanner cards without any need for a PC). A great way to engage and develop the next tech-savvy generation!

**Topics** : Robotic Programming, Sensors, Logical Thinking, Problem Solving, Teamwork etc.

**Level** : K1 & K2

**Duration** : 1½h

**Cost** : Free Trial

New!

### CONSTRUCTOR ROBOTICS SERIES

#### ***C-Robo RR Module 1 – Builder***

Using a metallic constructor's kit, students learn the different parts of a robot and what makes a robot a robot. Power source, motors, microprocessor, nuts and bolts are some of the things that the participants will get their hands on in this workshop to build their own robot. Nuts and bolts! Yes, this is as real as it gets!

**Topics** : Robot Essentials, Wiring/Electronic Concepts, Input and Output Signals, etc.

**Level** : Sec 1 to Sec 4

**Duration** : 2h

**Cost** : Free Trial

New!

#### ***C-Robo RR Module 2 – Programmer***

Program the robot you built in Module 1! Acquire the basic programming skills by learning how to turn on and off the motors, buzzer and LED lights of your robot. Arrange in a sequence how these outputs are switched on and off and your robot should be able to accomplish the different tasks in this workshop.

**Topics** : Programming, Logical Thinking, Robotics

**Level** : Sec 1 to Sec 4

**Duration** : 2h

**Cost** : Free Trial

New!

#### ***C-Robo RR Module 3 – Commander***

Take your programming skills to the next level by learning how to use sensors, how they work and how they make your robot react to its environment. Contact switch and IR sensors are the two input devices that will equip your robot to follow a line, go through a maze or even avoid falling off the table!

**Topics** : Programming, Touch Sensor, IR Sensor, etc.

**Level** : Sec 1 to Sec 4

**Duration** : 2h

**Cost** : Free Trial

New!

\*CW4U – Check Website For Updates.

## HUMANOID (VIRTUAL/NON-VIRTUAL) ROBOTICS SERIES

### ***H-Robo (Different Modules)***

As robots get a more humanoid form, they present a different kind of robotics challenge. Often able to mimic humanlike movements and sensory inputs, these robots seek to find a place in the world we live in. To help them better adapt, we build virtual worlds for them to exist in and explore. In turn, we are fascinated by a world without boundaries, of ever changing landscapes. Co-space imagining and engineering is brought to the fore. How will our worlds and futures intertwine?

Will robots become us and we become robots. These modules let a student explore higher order skills that is both technical and non-technical. The future beckons.

**Topics** : Humanoid Robot Programming, Sensors and Motors, Virtual World Design and Build, Co-space Engineering, Remote Robotics, etc.

**Level** : Sec 1 to Tertiary

**Duration** : 1½h

**Cost** : Free Trial



\*CW4U – Check Website For Updates.





## FROM EMBRYOLOGY TO STEM CELL BIOLOGY

The theme of this lecture concerns embryonic development and the impacts of scientific advancement in the domain of developmental and stem cell biology. The speaker will use simple explanations to illustrate basic concepts in this rapidly moving field in life sciences.

The lecture is suitable for upper secondary, polytechnic, and junior college students.

Speaker profile: Professor Lim Tit Meng obtained his PhD from Cambridge University after getting a First Class Honours degree in Zoology at the National University of Singapore (NUS). He has 20 years of teaching experience as an academic in NUS, and an award winning lecturer. Currently he is the Chief Executive of the Science Centre.

**Topic:** Stem cell biology, hope or hype?

**Date :** 17 Feb 2010

**Time :** 3.30pm to 5.30pm

**Duration :** 2 h

**Capacity :** 80min, 200 max

**Cost :** Free

*Admission fee to Science Centre applies to Non-Institutional School Members*

Book the programme by faxing booking form on page 87 to us at 6561 6361.

## INNOVATIONS & INVENTIONS

We are surrounded by man-made things. Someone somewhere has thought about our needs and found solutions which we are willing to pay for. How did inventions come about? Is invention really hard? How can I invent and innovate? What are the secrets from the files of the Orville and Wilbur Wright, Thomas Edison & his invention factory, Henry Ford, Steve Job & Steve Wozniak, Edwin Land, Akio Morita & Masaru Ibuka .....?

"You know, we don't grow most of the food we eat. We wear clothes other people make. We speak a language that other people developed. We use a mathematics that other people evolved... I mean, we're constantly taking things. It's a wonderful, ecstatic feeling to create something that puts it back in the pool of human experience and knowledge." Steve Job, CEO Apple Inc

The lecture series is for anyone interested in inventing new things. It is suitable for upper secondary, polytechnic and junior college students.

Anyone can invent things but the challenge is to bring it to fruition. These lectures give you pointers in that direction with inspirational stories of inventions and innovations not just the well known inventors but from kids, ladies ... and men too!



Each topic is of 2 hours duration (3pm to 5pm). The lectures are independent and can be taken alone.

**Speaker Profile:** Dr Tsai Her Mann received his BSc and PhD in aeronautical engineering from Imperial College of Science & Technology, London. He has worked in Queen Mary College, London and DSO National Laboratories, Singapore, where he researched and developed codes for applied aerodynamics studies. In 2000 he was a co-founder of a startup company where he served as the CEO. Dr Tsai was also a principal investigator with Temasek Laboratories, National University of Singapore, where he started university based defense related aeronautical problems; from experimental flow control to flow computations, and analysis for design to optimization of aerodynamic devices. He has taught in the Engineering Faculty in National University of Singapore for over 7 years. To date Dr Tsai has published over 110 articles and co-edited a book on flow control. Currently he is a Fellow of the Science Centre in Singapore. He is also teaches in the Industrial Design Group of the Department of Architecture.

Book the programme by faxing booking form on page 87 to us at 6561 6361.

**Time :** 3.30pm to 5.30pm

**Duration :** 2 h

**Capacity :** 80min, 200 max

*Admission fee to Science Centre applies to Non-Institutional School Members*

#### **Lecture 1: Innovations & Inventions**

Do inventions depend only on magic Eureka moments? Are innovations and inventions the outcome of only some brilliant inventors? Is it difficult to find useful solution? Who are the well-known innovators and what made their inventions significant? Innovation verses invention?

#### **Lecture 2: Creative Mindset**

Creativity is the input and innovation is the output! Is there a pattern or each creative mind is a unique 'creation'? Can you develop such a mindset or it is something gifted? Can we learn to be more idea prone?

#### **Lecture 3: The Act of Innovation**

Innovation is tough work! The passion to be different, working for better user experience, pursuing excellence, working in a team and staying very focus are all part of the deal. How this can be done.

#### **Lecture 4: Essentials of Invention**

The key elements of solving problems, prototyping to learn, protecting your invention, producing your product and promoting for sales

## **Science Centre Volunteer Induction Course**

This 2.5 hour workshop aims to orientate students interested in serving in the Science Center under the School Community Involvement Project (CIP), or as Volunteers to the Science Center, or for work attachment. Students will be given an overview of the mission, organization, and corporate culture of the Centre. Possible roles and functions will be explained; expectations and privileges will be elaborated on. There will also be a guided tour around the exhibition galleries, laboratories and Ecogarden. This course is a pre-requisite for future engagement and deployment under CIP or as volunteers or work attachment.

Dates: Jan 27, Mar 10, May 26, Aug 11 and Oct 27

Time: 3pm - 5pm

Book the programme by faxing booking form on page 87 to us at 6561 6361.

## STARLAB – A PORTABLE PLANETARIUM

Step into the STARLAB – the portable planetarium system and leap into the night sky. Learn the names of stars and constellations observable at night and how they move across the sky. STARLAB is a real planetarium, when inflated it requires a room at least 7m by 7m and a 3.5m ceiling. It brings the delights of the night sky to students during the day.

It comprises a star projector and an inflatable dome. It can be used to present a large variety of exciting planetarium lessons for various age groups. The system is available for rental.

Alternatively, you may want to engage our Education Officer to conduct the session for you at your school. We can customise an astronomy course at your request, such as constellations, phases of the Moon, colour of stars, the Solar System and many more. Contact us for more details on possible topics.

### RENTAL RATES (Per Day)

#### Package A (Without Instructor)

**Normal Rate**  
S\$200 + 7% GST

**Member Rate**  
S\$160 + 7% GST

#### Package B (Without Instructor) at your school

**Normal Rate**  
S\$900 + 7% GST

**Member Rate**  
S\$720 + 7% GST

Pickup and delivery of the portable planetarium is the responsibility of the renter. The GST charge will be levied.

\*\* The rates are inclusive of equipment and instructor at site. The GST charge will be levied. Please allow for 1-hour lunch break if it is a whole day event. The timing for the day starts from 9.00am to 4.00pm.  $\frac{1}{2}$ -hour session with 15mins break is recommended.

### Discover Science Resources (DSR)

Discover Science Resources (DSR) is an initiative under the collaboration between the Agency for Science, Technology & Research (A\*STAR) and the Science Centre Singapore. It was launched on 16 November 2005. Discover Science Resources is an educational outreach projects that makes available science resources such as kits, mini-exhibits and posters to teachers for use in their lessons, Science Days, Science Camps and Open Houses etc. Each DSR unit has materials on specific science theme corresponding to the school syllabus. Through an online booking and a hassle-free delivery system, schools can look forward to the support and availability of several unique and attractive science teaching aids to help them make their science related projects or lessons more memorable. It has more than 15 topics offered. The DSR scheme has proven to be very popular with both the primary, secondary and JCs. In 2008, 30 bookings were received and students from more than 20 schools had enjoyed the mini-exhibits and kits. ([www.science.edu.sg/dsr](http://www.science.edu.sg/dsr))



## STaR KITS

STaR Kits (Science Teaching and Resource Kits) are designed to support the teaching and learning of science through inquiry-based activities.

Targetted at primary and secondary levels, the kits can be used to develop inquiry process skills in students and to stimulate student talk as they construct understanding about science concepts or ideas.


STaR Kits is collaboration between Ministry of Education, Singapore and Science Centre, Singapore.

### **Where can I purchase STaR Kits?**

STaR Kits can be purchased from Curiosity shop at Science Centre Singapore. For bulk order from schools, please submit order form to Science Centre. The order form can be downloaded from Science Centre website <http://www.science.edu.sg>. For enquiries, please email [star@science.edu.sg](mailto:star@science.edu.sg)

Note: If you have interesting ideas for science teaching kits to support inquiry-based activities, and would like to explore with Science Centre to develop and prototype these ideas into actual kits, please email [star@science.edu.sg](mailto:star@science.edu.sg). We look forward to your contribution to a growing pool of STaR kit resources!





The Omni-Theatre is Singapore's only IMAX theatre. Equipped with a 5-storey high dome screen and state-of-the-art IMAX technology, it screens large format movies (15 perforation/70mm), which provides an immersive and educational cinematic experience.

As the 70mm film frame is 10 times bigger than the 35mm film used in conventional cinemas, the projected images and digital surround-sound effects transport students right into the heart of the action!

### **IMAX Movies**

The theatre screens 40-minute educational IMAX movies, which are produced in consultation with prestigious learning institutes and industry specialists to meet recognised educational standards. The topics covered include the environment, nature, geography, the arts, technology and space exploration, to name a few. Woven within inspiring storylines and human drama, these movies provide students with unique and exciting opportunities to explore new worlds and new ideas.

In conjunction with selected IMAX movies, accompanying mini exhibitions would also be held in the theatre lobby to enhance learning.

### **Movie Schedule**

The theatre screens 4 new movie titles a year. More information about the new movies (to be launched in Mar, May, Sep and Nov) would be provided nearer to date. For more information about current movie titles and showtimes, visit [www.omnitheatre.com.sg](http://www.omnitheatre.com.sg).

## **Under the Sea (till April 2010)**

UNDER THE SEA is a marine adventure which will transport students to some of the most exotic and isolated undersea locations on earth, including Southern Australia, New Guinea and others in the Indo-Pacific region, allowing them to experience face-to-face encounters with some of the most mysterious and stunning creatures of the sea. It offers a uniquely inspirational and entertaining way to explore the beauty and natural wonder of the oceans, as well as the impact of global climate change.

### **Pre/Post-Movie Programmes**

**FREE 30-minute Lecture Demo** (max 200 students per session)

To complement the movie and complete the learning experience, a free 30-minute Lecture Demo is conducted for school groups which book a 40-minute IMAX movie. The content is specially designed by Science Centre to elaborate on concepts and principles which are related to the movie.





### Hall of Science

Located on the 2nd floor of the Omni-Theatre, the Hall of Science offers students a fun-filled learning experience on the solar system and the universe. Through the use of interactive exhibits and information panels, students will be able to obtain a broad overview. It is recommended that students spend about 30 minutes in this exhibition gallery. Worksheets on the exhibition are available upon request.

### Admission Charges (40min IMAX movie)

<b>Public</b>	\$10 per adult \$5 per child (3–12 years)
<b>Institutional/Associate members</b> (minimum 30 students)	\$3 per student (Primary schools) \$4 per student (Sec/JC/ITE student) Free admission for 3 teachers per group of 30 students \$8 Additional Teacher
<b>Non members</b> (minimum 30 students)	\$4.50 per student (Primary schools) \$8 per student (Sec/JC/ITE student) Free admission for 3 teachers per group of 30 students \$8 Additional Teacher

### Please note:

- The theatre seating capacity is 276.
- The theatre is closed on Mondays except school and public holidays.
- All movies begin promptly. Please arrive at the theatre at least 15 minutes before showtime.
- Special arrangements can be made to screen the movie at your preferred time, if you make a block booking for the whole theatre with a minimum of 200 students.
- Payment procedure will be advised upon booking confirmation.
- Groups, which fail to turn up without prior cancellation, will be billed as registered.
- Programmes, schedules and admission charges are subject to change.
- The concession rate for Institutional Members is valid from Tuesdays to Fridays and on Saturday mornings only. The concession rate does not apply on Saturday afternoons, Sundays and public holidays.

## SCIENCE ON THE GO



Can't come to the Science Centre? Then let the Science Centre come to you! Our Outreach Programmes offer convenient, affordable, and unique science learning experiences.

The programme consists of a half hour inspiring science show to be conducted at school's premises, followed by enrichment classes at the Science Centre. *The following science shows are available for booking.*

### Loony Balloony

Balloons are more than just bouncy decorations waiting to burst in your face. They might be common everyday objects but when coupled with science, the effect is almost magical. Our educators will treat you with outrageous experiments and a few cool tricks – ALL with a touch of science. Try them out yourself and amaze your friends and family. You won't want to miss a single moment of the Loony Balloony Show!

### CheMystery

Chemistry is part of your everyday life. No matter where you look, there is always a reaction going on behind the scenes. We bring these exciting reactions to you, live and upfront. Witness vivid colour changes right in front of your very eyes! Be entranced by exotic odours and enthralled by explosive demonstrations! Let our friendly educators show you how chemistry in your life can be fun. So get a life! Watch CheMystery!

Each show is performed by two Science Educators.

Duration: 30 minutes per show

Comfortable group size: 100 to 300 students

### Cost:

<b>30 minutes session</b>	Non-Member School S\$400	Member School S\$250
<b>Each additional session</b> (within the same day)	Non-Member School S\$200	Member School S\$125

\* The above cost does not include two-way transport charge at S\$80 between Science Centre and the school.

\*\* A 7% GST charge will be levied.

For more information, please refer to Science Centre website:, click "Science on the Go". For booking of the programmes, please download the booking form from the website and fax back the completed form to: 65616361.

For further enquiries, please e-mail to: [outreach@science.edu.sg](mailto:outreach@science.edu.sg)

### Science Centre Learning Passport

Every Science Centre member school will be issued with a Science Centre Learning Passport. The passport is a guide to help you plan your students' learning journey at the Science Centre.

You'll gain one stamp for every 100 students who participated in our Science Enrichment Programmes at the Science Centre. Please bring along the learning passport every time your students attend our Science Enrichment Programmes. Our instructors will verify the attendance of the students on the passport at the end of each programme. They will issue the stamp on the spot should the attendance reach 100 each time.

For every 10 stamps accumulated, your school is entitled to redeem a 30 min Science Show or Enrichment Talk to be conducted at your school.

For redemption matters, please e-mail to: [outreach@science.edu.sg](mailto:outreach@science.edu.sg)





### ***A\*STAR Talent Search (ATS)***

**April**

A\*STAR Talent Search (A\*TS) is an initiative to reward students who have performed well in scientific research. The competition is organised by A\*STAR and the Science Centre. It replaces the National Science Talent Search (NSTS) w.e.f. July 2005. It is opened to students aged 15 to 21 years and is conceptually similar to the US Westinghouse Science Talent Search. Participation in ATS is on an individual basis and the judging criteria include depth of understanding of the project, creative and independent thinking, as well as scientific attitude, motivation and interest. ([www.science.edu.sg/a-ts](http://www.science.edu.sg/a-ts))

### ***Singapore Science & Engineering Fair (SSEF)***

**March**

SSEF is organised by the Ministry of Education (MOE), A\*STAR and the Science Centre. SSEF is organised for students from the upper secondary & JC levels. The SSEF entries are often of very high quality as many of them were carried out under the supervision of lecturers and scientists in the Institutes of Higher Learning (IHLs) and Research Institutes and Centres (RICs). The competition is affiliated to the INTEL International Science and Engineering Fair (ISEF). ISEF is a network that comprises of every state in the U.S. and 40 countries. A maximum of 2 individual winners and 1 team winner (comprising a maximum of 3 members) will be selected to represent Singapore in ISEF each year. The programme receives joint sponsorship funding of \$10,000 from DSTA and DSO. ([www.science.edu.sg/ssef](http://www.science.edu.sg/ssef))

### ***National Junior Robotic Competition (NJRC)***

**Aug - Sept**

The National Junior Robotics Competition (NJRC) is an exciting and unique robotic competition organised by A\*STAR and the Singapore Science Centre and supported by the Ministry of Education and the Singapore Totalisator Board. This all-round competition promotes strategy building, teamwork and creativity amongst the student-participants. The teams of contestants are provided with Lego Mindstorms Robotics Invention Systems Kit and have six weeks to assemble the robot and program it to overcome a challenging "Playing Field". The teams are also required to set up web pages, featuring their team and their robots and submit a report of what they have learned from the competition. ([www.science.edu.sg/njrc](http://www.science.edu.sg/njrc))

### ***Sony Creative Science Award Competition***

**July**

The Sony Creative Science Award is a collaborative project between the Science Centre, Sony, the Ministry of Education and A\*STAR. This is an annual toy-making competition for primary school students to encourage them to display their creativity and ability to describe the scientific concepts behind their toys. Sony provides the main funding for the project. The A\*STAR-SC collaboration provides partial funding for the project. ([www.science.edu.sg/scsa](http://www.science.edu.sg/scsa))

### ***Tan Kah Kee Young Inventors Award (TKKYIA)***

**May**

The Tan Kah Kee Young Inventors' Award competition is a collaborative project between the Tan Kah Kee Foundation, DSTA and A\*STAR. The Science Centre supports the collaboration through its involvement in the award ceremony, the setting up of the exhibition of winning entries as well as the running of the Inventors' Week programme for schools to promote visits to the exhibition as well as interest in the competition. ([www.science.edu.sg/tkkyia](http://www.science.edu.sg/tkkyia))

### ***Science Buskers Festival***

**Sept (Finals)**

Introduced as a new initiative in 2008, Science Buskers Festival is organised by the Agency for Science, Technology and Research (A\*STAR) and the Science Centre (SC). This new initiative encompassed the idea of developing the individual's communication skills through expressions of science in creative manners. Organised as a competition, Science Buskers Festival served as an excellent platform to spread key messages relating to the importance of making science "alive" in action. During the competition, contestants did a "show-and-tell" on any science topic, and judging was based on audiences' votes and judges' scores. ([www.science.edu.sg/buskers](http://www.science.edu.sg/buskers))



## ***National Science Challenge 2010***

### **Screening in Aug**

National Science Challenge, a project under the collaboration between Science Centre and A\*STAR which aims to revive the national interest in science through a televised science quiz. The first in the series of the science quiz was called "The Great Science Challenge" and it was aired on Media Corp TV Channel 5 in 2004. The programme was re-named "The National Science Challenge" in 2005 and has been held annually since. The project aims to meet the following objectives:

- To stimulate, encourage and nurture the passion for scientific inquiry in youth
- To cultivate and develop scientific abilities, such as creative thinking, problem solving and collaboration skills in youth
- To expose parents and educators to science as they play a key role in the children's development
- To promote scientific research as a challenging, rewarding and attractive career

([www.sciencer.edu.sg/nsc](http://www.sciencer.edu.sg/nsc))

## ***Corridor of Science News***

Video walls or high definition television screens was set up along the walk-way of SSC's galleries. Upon arrival, the visitors will be greeted by the science teasers, S&T information and news, updates of A\*STAR scholarships and the award winners that are displayed on the screens.

## ***Meet The Scientist (MTS)***

An engaging and fun session that bring local scientists out of the labs to interact with students and the public. Researchers will take the audience on a journey into the exciting world of research. The session also provides audience with an opportunity to find out how science and technology may be affecting their lives in the near future. Just ask the scientists!



Snow City adheres to the above educational mantra. Hence it developed various educational programs, which caters to both visual and experiential learners and enthusiasts.

Now, you'll have more variety to choose from with our BRAND NEW team-building 'Winter Olympics' program. Conducted by our Game Masters, 'Winter Olympics' aims to foster group dynamics and cohesiveness while having a ball of a time at it.

Below is the list of carefully planned programs that focus on learning, fun, and team-building.

<b>Educational Package [ A ]</b>	<b>Educational Package [ B ]</b>	<b>Educational Package [ C ]</b>
<ul style="list-style-type: none"> <li>• 1 hour Snow Play</li> <li>• 1 hour Enrichment Program</li> </ul> <p><b>Fees: \$13</b></p>	<ul style="list-style-type: none"> <li>• 1 hour Snow Play Time</li> <li>• 30 min Team-building 'Winter Olympics'</li> </ul> <p><b>Fees: \$15</b></p>	<ul style="list-style-type: none"> <li>• 1 hour Snow Play Time</li> <li>• 30 min Team-building 'Winter Olympics'</li> <li>• 1 hour Enrichment Program</li> </ul> <p><b>Fees: \$22</b></p>

- Minimum booking size of 30 students.
- Each teacher at \$10 each.
- Provision of Winter Jacket and Boots only.
- Bookings must be made at least 2 weeks in advance.
- Kindly dress warmly with long pants and socks.
- Optional glove rental at \$2.00 (adults and children 10 yrs or above) and \$1.50 (children below 10 yrs).
- Optional water-proof pants rental at \$4.00 each.

#### **Educational Package [ D ]**

- 2 hour Sub-Zero Team-building Programmes

**Fees: \$30**

- Minimum 30 Students ( Only for Secondary and post secondary level)
- Bookings must be made at least 1 month in advance
- Teachers are charged \$15 each (Max 2 teachers)
- Provision of Winter Jacket and Boots, Water-proof pant and gloves.
- Kindly dress warmly with long pants and socks

### Educational Package [ E ]

- 1 hour Snow Play Time
- 1 hour Enrichment

Programme (Special MindChamps Learning Technique worth \$98 per child)

**Fees: \$50**  
(inclusive of MindChamps workshop materials)

- Minimum 40 Students
- Bookings must be made at least 1 month in advance
- Teachers are charged \$25 each (Max 2 teachers)
- Provision of Winter Jacket and Boots, Water-proof pant and gloves.
- Kindly Dress warmly with long pants and socks

For more information,  
Please contact us at 6560 2306 or email: [contact@snowcity.com.sg](mailto:contact@snowcity.com.sg)

## Time Slots

### Educational Package [ A ]

Time Slots	Itinerary	
A	9.45 am – 10.45 am 11.15 am – 12.15 pm	Snow Play Time <b>Enrichment Program</b>
B	9.45 am – 10.45 am 11.15 am – 12.15 pm	<b>Enrichment Program</b> Snow Play Time
C	2.15 pm – 3.15 pm 3.45 pm – 4.45 pm	Snow Play Time <b>Enrichment Program</b>
D	2.15 pm – 3.15 pm 3.45 pm – 4.45 pm	<b>Enrichment Program</b> Snow Play Time



### Educational Package [ B ]

Time Slots	Itinerary	
A	10.45 am – 11.15 am 11.15 am – 12.15 pm	<b>Team-building 'Winter Olympics'</b> Snow Play Time
B	11.15 am – 12.15 pm 12.15pm – 12.45pm	Snow Play Time <b>Team-building 'Winter Olympics'</b>
C	1.45 pm – 2.15 pm 2.15 pm – 3.15 pm	<b>Team-building 'Winter Olympics'</b> Snow Play Time
D	3.45 pm – 4.45 pm 4.45pm – 5.15pm	Snow Play Time <b>Team-building 'Winter Olympics'</b>

### Educational Package [ C ]

Time Slots	Itinerary	
A	9.45am – 10.45am 11.15 am – 12.15 pm 12.15pm – 12.45pm	<b>Enrichment Program</b> Snow Play Time <b>Team-building 'Winter Olympics'</b>
B	1.45pm – 2.15pm 2.15pm – 3.15pm 3.45pm – 4.45pm	<b>Team-building 'Winter Olympics'</b> Snow Play Time <b>Enrichment Program</b>
C	2.15 pm – 3.15 pm 3.45pm – 4.45pm 4.45pm – 5.15pm	<b>Enrichment Program</b> Snow Play Time <b>Team-building 'Winter Olympics'</b>

### Educational Package [ D ]

Time Slots	Itinerary	
A	10.00am – 12.00am	<b>Subzero Team building</b>
B	2.00pm – 4.00pm	<b>Subzero Team building</b>

### Educational Package [ E ]

Time Slots	Itinerary	
A	10.00am – 12.00am	<b>MindChamps Program</b>
B	2.00pm – 4.00pm	<b>MindChamps Program</b>



### Overview

Snow City's educational programmes are all conceptualized in the context of low temperatures (from  $-1960\text{C}$  to  $00\text{C}$ ). The main goal of the programmes is to foster interest in science through the novel experiences offered by the exciting lecture demonstrations and hands-on activities. The programmes provide a unique experience to the students—that is, exposure to cryogenic chemicals such as liquid nitrogen and liquid oxygen. This is an experience that cannot be duplicated in ordinary classrooms. They also serve as enrichment/reinforcement activities to classroom lessons. They can also cater to a wide range of audiences. The Education Officers, who conduct the programmes, can vary the level of discussion/explanation for each lesson depending on the type of audience.

### ***Fun with Liquid Nitrogen 1***

This is Snow City's most popular program. It is recommended for those who attend low-temperature science programs for the first time. The program involves several demonstrations that showcase the properties of liquid nitrogen. Students will be awed by liquid nitrogen as it smokes, expands, and evaporates. The ability of liquid nitrogen to readily freeze objects will definitely amaze students. This fun-filled program also touches on concepts of force, pressure, effects of cooling, properties of materials, and change of state from a temperature of  $-1960\text{C}$  to room temperature.

**Category** : Lecture Demonstration  
**Level** : Pre-School to Junior College  
**Date** : All Year Round  
**Venue** : Snow City

### ***Fascinating Snow***

Learn everything you need to know about snow through a series of interesting and engaging demonstrations. Enrich yourself and learn how snow is formed, factors that affect shape of snow crystals and why snow appears white. The process on how artificial snow is made would also be discussed and illustrated with "Freezing cool" demonstrations. Other topics covered would include water, snow sports and environmental issues concerning snow.

**Category** : Lecture Demonstration  
**Level** : Pri. 5 to Sec. 2  
**Date** : All Year Round  
**Venue** : Snow City

### ***Ice Cream Making DIY***

The programme opens with a brief history of ice cream. The different ingredients used in making ice cream are then presented to students. Different techniques in making ice cream will be discussed, with emphasis on the use of liquid nitrogen. Students will be asked to form small groups, and together they will prepare their group's ice cream using liquid nitrogen. On top of that, students will get the chance to savour the ice cream that they have prepared. The experience is expected to be memorable for the students. They get to learn science concepts such as transmission of heat energy by conduction, effects of heat exchange, and thermal properties of matter. The multi-sensory experience provided by this programme helps to cement the students' understanding of various science concepts further.

**Category** : Workshop/Hands-on  
**Level** : All Ages  
**Date** : All Year Round  
**Venue** : Snow City





### Overview

A compulsively enjoyable programme fit for anyone that just wants to have a roaring good time. Conducted exclusively in the Snow Chamber, Winter Olympic is a culmination of carefully tailored activities that challenges the mind while testing your physical agility. It is a program catered to the young and the young at heart. After all, having fun has absolutely no age limit. Winter Olympic is a specially designed programme that effectively incorporates team building into its host of activities with light-heartedness and exhilaration. For any game planner, it is an extremely versatile programme, as it allows the planner to mix and match from its pool of activities based solely on his/her objective. So why choose convention when convention is boring. At Snow City, we provide you with the perfect alternative to convention.

**The cool way. Note: Choose any 3 of the total 10 activities to fit your gaming objective.**

#### Activity 1: Speedo

**Category :** Adults and Children (above 8 years old)

**Synopsis :** Each player from each team will slide down the slope one by one. Every team will be timed. Timing starts at the point when the first player slides down and ends when the last player of the group completes the slide. The team with the fastest time recorded will be the winner.

#### Activity 2: Breakage

**Category :** Adults and Children (above 8 years old)

**Synopsis :** Everyone in a team will log his or her arm to form a chain, with different formation, and slide down the slope together. The chain should not break. The team with no breakage will win the game.

#### Activity 3: The Mad Ball

**Category :** Adults and Children (above 8 years old)

**Synopsis :** Each player from each team will use his or her mouth to hold a plastic cup, containing a ping pong ball. They will slide down the slope one by one. Once he or she reaches the bottom of the slope, he or she will place the ping pong ball into a big container. Whichever team has the most number of ping pong balls in the big container wins the game.

#### Activity 4: Balloon Hurray

**Category :** Adults and Children (above 8 years old)

**Synopsis :** 2 players from each team will hold each other's hands with a balloon in between them. They will slide down the slope together. Upon reaching the bottom of the slope, they will place the balloon into the big container. Whichever team with the most balloons in the big container wins the game.

#### Activity 5: Puzzles Frenzy

**Category :** Adults only

**Synopsis :** To search and solve puzzles. The puzzles are placed in the tug of snow. Each player will slide down from the slope and search for the puzzles (they must dig using both hands). Each player can only take one puzzle at a time. Once all the puzzles are collected, all the team players will get together to solve the puzzles. Whichever team solves the puzzles first wins the game.

#### Activity 6: Bursting Balloons

**Category :** Adults only

**Synopsis :** Each player from each team will slide down one by one. Once he or she reaches the bottom of the slope, he or she will have to burst a balloon with both hands. Only when he or she has burst the balloon, will the next player able to slide down and repeat the process. There is a time limit of 10 mins. The team, which is able to burst the most balloons within the time limit, wins the game.

### Activity 7: Snowy Hunt

**Category :** Adults and Children (above 8 years old)

**Synopsis :** All the team players will slide down to the bottom of the slope. Once they reach the bottom of the slope, they will have to start searching for white envelopes, containing one poker card, which is being cut into 2. They will have to try to join the poker cards with their other halves. For example, if a player finds half of spade queen, he will have to look for the other half of spade queen. The team with the most number of joined poker cards will win the game.

### (PACKAGE D) NEW!

#### ***Snow City Sub-Zero Student Team Building Program***

Snow City's Sub-Zero Student Team-building programme is one with a difference. Designed specifically for students, it centres on team survival in sub-freezing conditions.

Conducted by experience facilitators, our program will challenge students to "survive" in freezing conditions. Activities including Glazier Crossing, Frozen Lake Rescue and more, will test students' ability to work as a team and help them develop and apply effective life skills such as communications, creative thinking, decision-making and leadership.

Fun and enjoyable but with a very serious aim to it, our team-building will help students identify and develop excellent team dynamics that will improve team performance in the school and for the future.

**Target** : Secondary to Junior College  
**Date** : All Year Round  
**Venue** : Snow City  
**Category** : Workshop/ Hands-on

### (PACKAGE E) NEW!

#### ***Champs on Ice***

This 2-hour fun learning workshop is specifically designed by MindChamps, the world leading Specialists in Mind Development Programs. Using the unique environment as a basis this program looks at the effects of cold on the human body.

The workshop will serve to integrate both the Creative and Learning Mind to nurture a Champion Mindset. It will inspire students to greater levels of confidence and cooperation. By inculcating a sense of fun and exhilaration in the interactive games, the students will be able to tap into the powers of their imagination, to break free of the norm.

Students will explore the following:-

- Two Active Recall techniques for enhanced memory
- "All About Winter"
- How Does cold effect the Human body
- Role play to access the power of the imagination
- What is cold? Where is cold? How is life different from the tropics?

It comprise 1 hour of snow play and 1 hour of MindChamps Learning Technique. (program content will be adapted according to students' ages)

**Target** : Primary to Secondary School Level  
**Date** : All Year Round  
**Venue** : Snow City  
**Category** : Workshop/ Hands-on



# Educational Package Booking Form

Tel: 6560 1297

**Yes! We would like to confirm our booking.**

**Particulars** (Please print)

Name of School:	
Address: _____ Singapore ( _____ )	
Contact Person:	
Tel: _____	Fax: _____
School Email Address: _____	

**Educational Package**

Program Code: \_\_\_\_\_ (Pls indicate)

- A
- B
- C
- D
- E

Total Pax : \_\_\_\_\_ (Adult) \_\_\_\_\_ (Students)

Date of Visit : \_\_\_\_\_

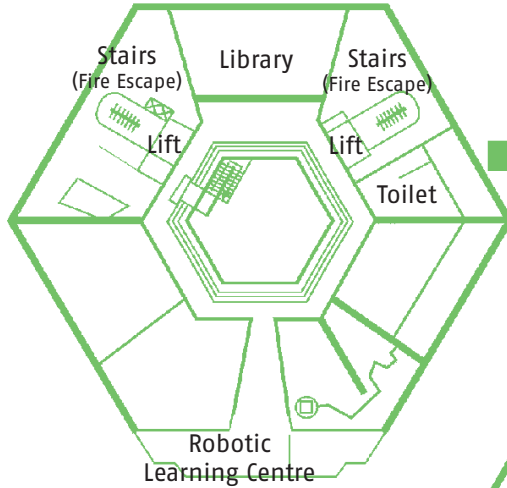
Preferred Time Slot:  A  B  C  D (Pls Indicate)

\_\_\_\_\_  
Signature of Principal

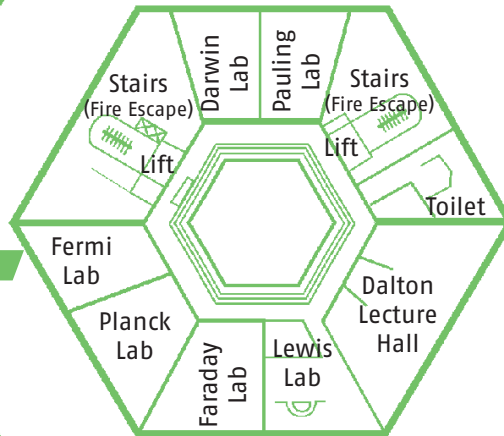
\_\_\_\_\_  
School Stamp

\_\_\_\_\_  
Date

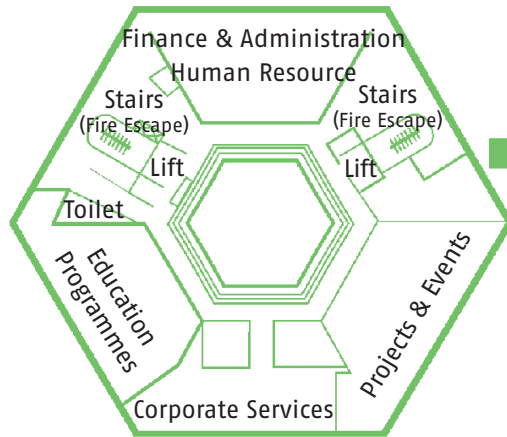
- Terms and conditions subject to change without prior notice.
- Not valid with other promotions.
- Booking is done on first come first served basis, subject to availability.
- A successful booking will be confirmed by fax or email.



Second Storey Floor Plan



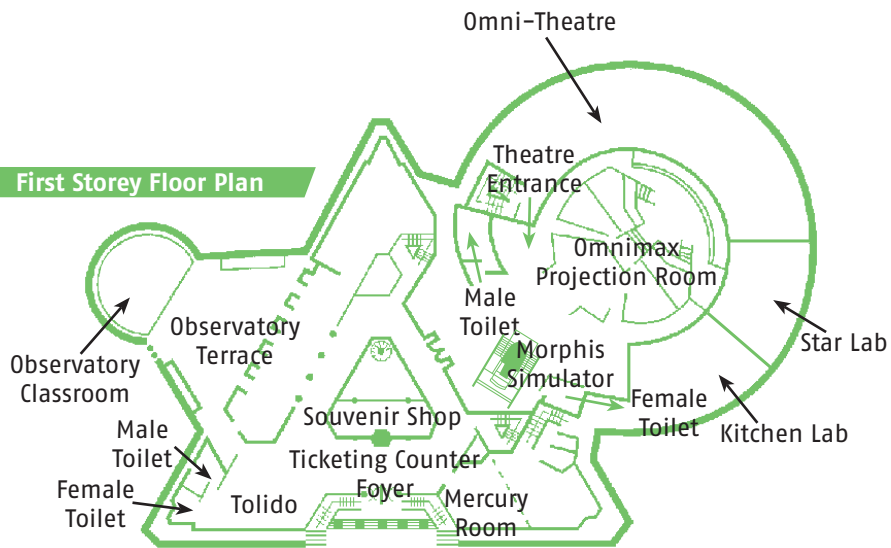
Third Storey Floor Plan



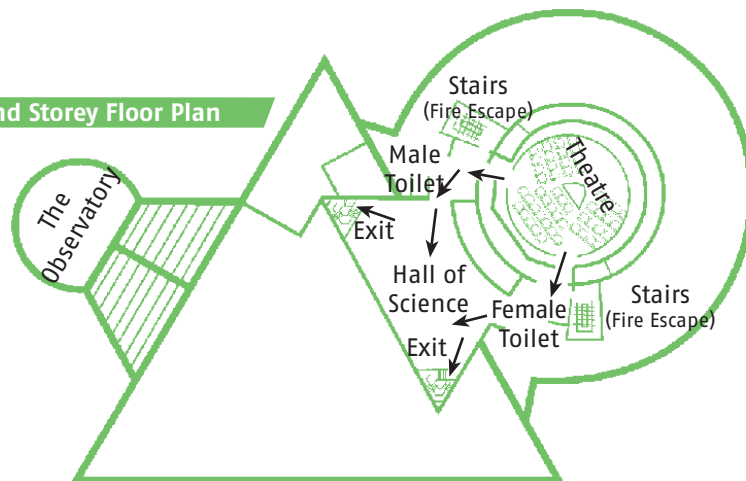
Fourth Storey Floor Plan

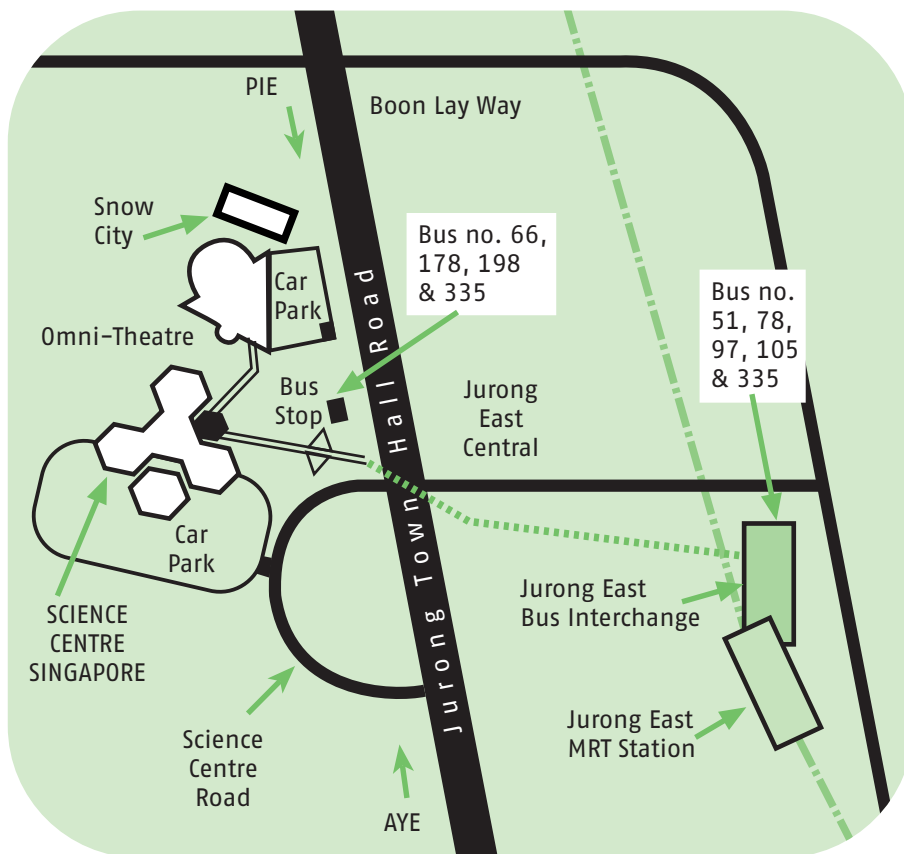


**First Storey Floor Plan**



**Second Storey Floor Plan**





**BUSES**

🚌 SBS numbers 66, 198, 335, 182 and SMRT number 178.  
Stop outside the Science Centre Singapore.

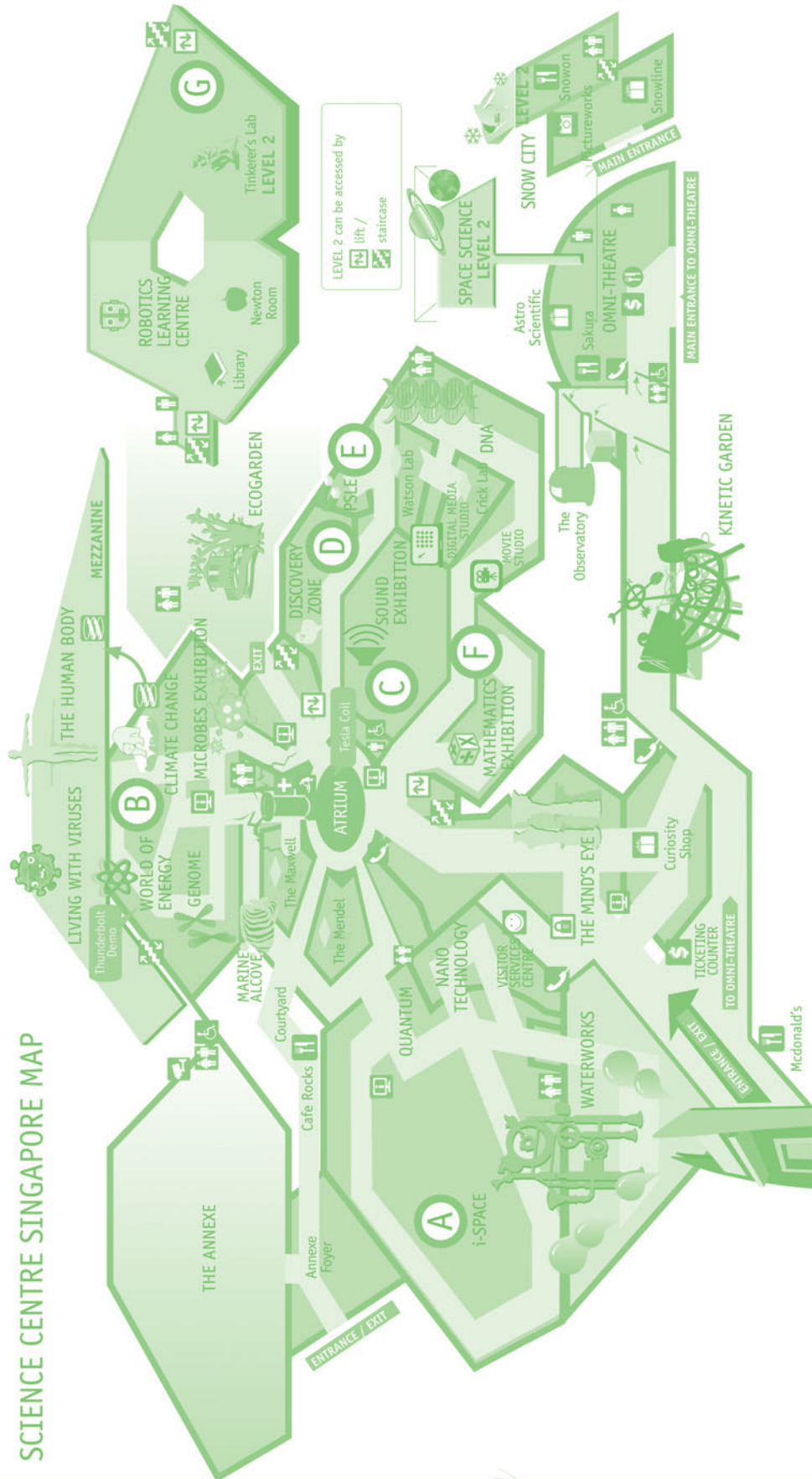
🚌 SBS numbers 51, 78, 97, 105, 182 and 197.  
Stop at Jurong East Interchange.

**MRT**

🚇 Stop at Jurong East Station and transfer to SBS number 335.

🚇 Alternatively, take a 10 minute walk by turning left at Jurong East Station and proceeding straight past the shops along Block 135.

# SCIENCE CENTRE SINGAPORE MAP



**LEGEND**

1. Lost and Found		
2. Member's Enquiry		
Information Kiosks		
Gift Shop		
Hall		

# 2010 Science Enrichment Programmes Booking Form



- This form may be copied if necessary
- Please use fresh Booking Forms for different school term
- Closing date for booking :  
Term 1 – 15 Feb 2010    Term 2 – 12 Mar 2010  
Term 3 – 14 May 2010    Term 4 – 20 Aug 2010

- Please complete Section A & B and return this form to:  
**Education Programmes Division**  
Fax: 6561 6361

- Please proceed to ticketing counter with your school member pass (if applicable) and confirmation letter.

- We will notify you of the status of your booking in Section C. Kindly acknowledge your acceptance of the allocated slots in Section D within one week upon receiving our reply.

## Section A Booking for Term 1, 2, 3, 4 (please circle)

Name of School: \_\_\_\_\_ Name of Teacher-in-charge: Mr/Mrs/Miss/Mdm/Dr : \_\_\_\_\_  
 Address of School: \_\_\_\_\_ Institutional / Associate Member: (Yes / No) \_\_\_\_\_ Expiry Date: \_\_\_\_\_  
 Tel.: \_\_\_\_\_ Hp.: \_\_\_\_\_ Fax no.: \_\_\_\_\_ Email: \_\_\_\_\_

## Section B To be completed by Teacher-in-Charge

Course Title	Preferred Date & Time		Level & Class	No of Students	No of Teachers
	Choices	Date			
	1 <sup>st</sup>				
	2 <sup>nd</sup>				
	1 <sup>st</sup>				
	2 <sup>nd</sup>				
	1 <sup>st</sup>				
	2 <sup>nd</sup>				
	1 <sup>st</sup>				
	2 <sup>nd</sup>				

\*as indicated in programme description

Date Submitted:

Remarks:

Processed By:

## Section C For Official Use

Status of Booking	Acceptance of allocated slot (please ✓)	
	Confirmed	Unsuccessful
	Cost (if any)	Y e s
		N o

## Section D Acknowledgement by Teacher-in-Charge





**Science Centre Singapore**  
15 Science Centre Road Singapore 609081

Tel: (65) 6425 2500 Fax: (65) 6565 9533 Website: [www.science.edu.sg](http://www.science.edu.sg)

*All programme descriptions and prices are correct at the time of printing.*