ARTSCIENCE MUSEUM™ PRESENTS

ALL POSSIBLE PATHS

RICHARD FEYNMAN'S CURIOUS LIFE

20 October 2018 – 3 March 2019

ACTIVITY SHEET

ArtScience Museum
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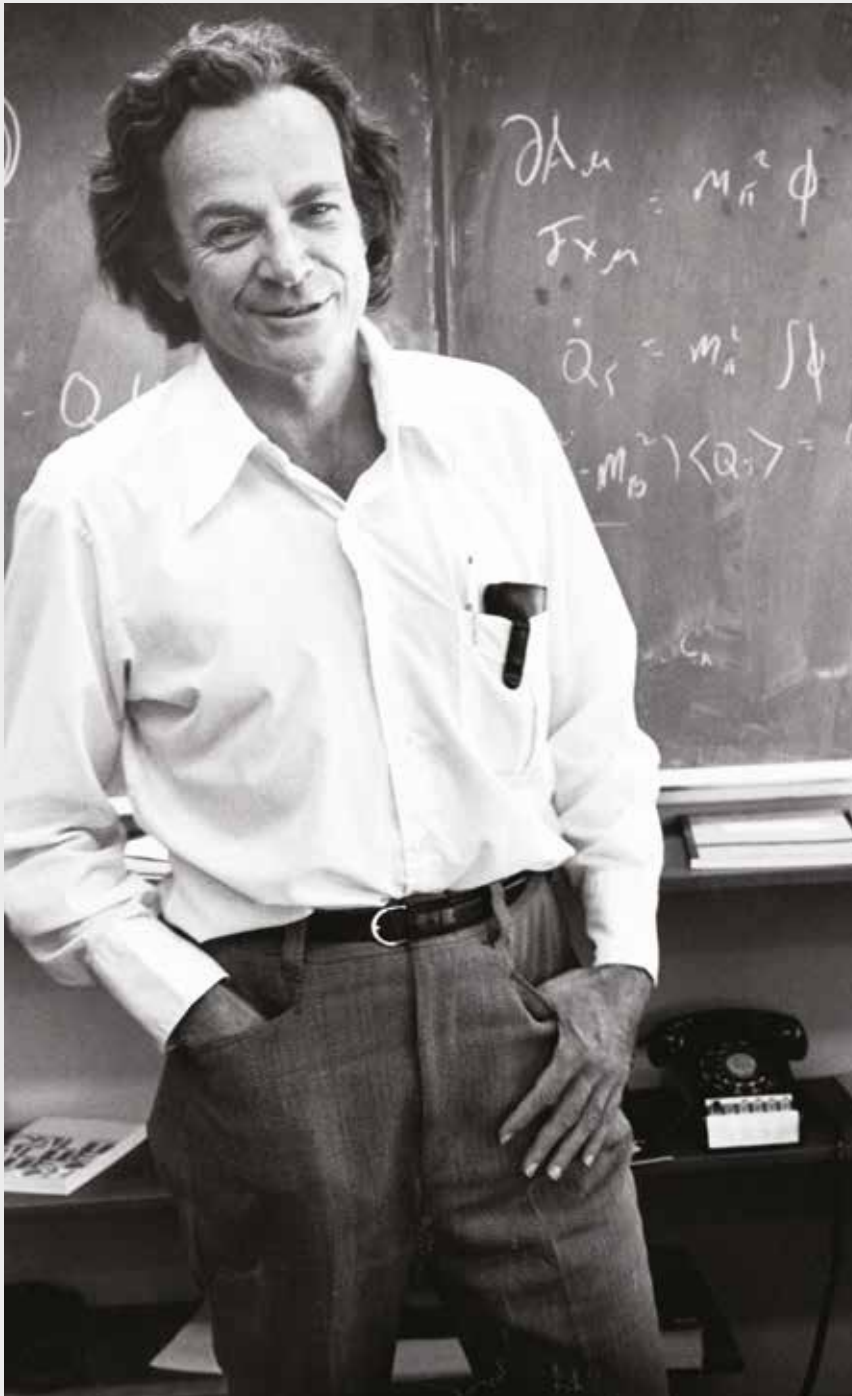
INTRODUCTION

ArtScience Museum is dedicated to the exploration of the interconnection between art, science, technology and culture and their roles in shaping the society. As a study of the creative processes that underlie the human experience, ArtScience Museum seeks to understand what drives creative people, how they acquire their skills and how they work. Using a combination of intriguing content and intellectual discussion in the exhibitions and programmes, these stories serve to inspire creativity in all of us.

This activity sheet is intended to spark curiosity before your visit to ArtScience Museum. Through content-based and hands-on activities, we hope to enhance the positive effects of out-of-classroom learning prior to your visit and scaffold students' museum experience during the visit.

Suggested activities are meant to be used as references and are not mandatory to complete before your visit.



Richard Feynman in his office at Caltech, 1974
Courtesy of Caltech Archives

ABOUT
THE EXHIBITION

All Possible Paths will showcase how Richard Feynman has contributed to our understanding of the fundamental mechanisms of the universe. The exhibition also highlights how his curious nature and unconventional thinking drove him to explore many possibilities in life — including art and music. The exhibition is presented in four thematic sections:

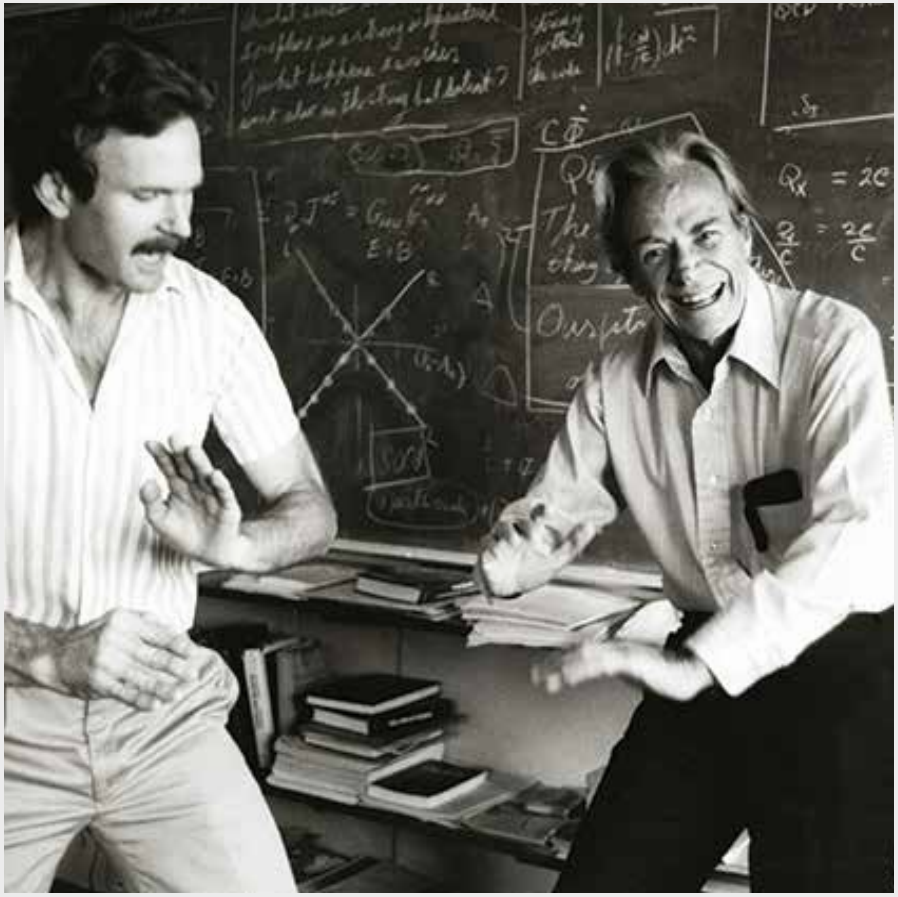
1. A Curious Life

2. The Great Explainer

3. The Pleasure of Finding Things Out

4. A Million More Discoveries

All Possible Paths invites visitors to peer into the mind of one of the greatest physicists of recent times and explore how he is a source of inspiration for generations of young scientists.



Richard Feynman and Ralph Leighton, c. 1980
Courtesy of Caltech Archives

ACTIVITY 1:

THE WORLD OF NANO

Physics is the study of how everything in the universe works — from the really big things such as stars and galaxies to the really small things such as subatomic particles.

Richard Feynman was a theoretical physicist who tries to understand the fundamental nature of the universe and invents theories. He was widely credited as the kick-starter of modern interest in nanotechnology.

In this activity, you will investigate what happens to things when they become very, very small. You will need a pair of scissors and remember to handle the scissors with care!

Step 1: Cut along the dotted line of this activity sheet.

Step 2: Cut the strip of paper into half.

Step 3: Pick up half of the strip and cut it into half again.

Step 4: Pick up the smaller half of the strip and cut it into half again.

Step 5: Keep track of the number of times you have cut the paper into halves.

Step 6: Continue until the paper is too small to cut anymore. (Be careful of your fingers!)

Observe what happens when you:

- Use your thumb to press on the circle and try lifting your thumb up.
- Use your thumb to press on the tiniest paper you had cut and try lifting your thumb up.

Share your observations with your friends!

What happened?

The scale of *particle physics* is much smaller than the size of the tiniest paper. And at this level, particle physicists are just getting started! Physicists such as Richard Feynman have done a lot of work trying to understand what kinds of elementary particles exist, and how the different particles interact with one another.

When we start to go into the world of nano, things start to act in strange ways. Some of the particles are so small that they can seem to occupy more than one space at once, or even have the power to 'teleport' through barriers!

These effects cannot be described using the rules of classical physics. Instead, scientists have to use a new set of rules called *quantum physics*.

'Feyn' out more about the world of quantum physics in our exhibition, *All Possible Paths: Richard Feynman's Curious Life* and learn more about nano-scale and beyond at our 'Feyn' out about Nano workshop!

ACTIVITY 2:

DIALOGUE WITH DIAGRAMS

Diagrams are simplified drawings that represent real-world events and things. Scientists use many diagrams to study the world and at the same time, help to simplify equations, visualise patterns, structures, functions and more.

In this activity, you are going to have a dialogue with diagrams!

You will need a pen and blank paper for this activity.

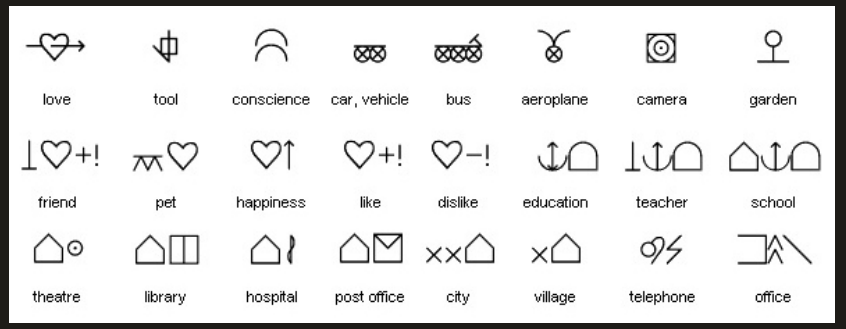
Step 1: Write three short sentences on the blank piece of paper. e.g. ***"I like eating chocolate and ice cream." "My sister went to the park, then she went to the zoo."***

Step 2: Without using any letters, turn each sentence into a drawing with a series of shapes. (A shape must represent the same word across all your sentences!)

Tip: ***You can use simple shapes to represent your words. For instance, you could draw ◯ to mean 'girl' and ▢ to mean 'boy'.***

Exchange your diagram with a friend. Without telling them your sentence, can they understand what your diagrams mean? How do you think you can make your diagram easier to understand?

Scientists use diagrams to simplify processes that are too complex to study as a whole. Instead of using complex equations, Feynman came up with a visualization method for the interactions of particles. The Feynman Diagrams represent the complicated series of events that happen when elementary particles interact with each other.
One important part of being a scientist is being able to take real-world processes and explaining to the general public using simple diagrams. Examples of symbols:



'Feyn' out more about Richard Feynman's life and legacy at our exhibition, ***All Possible Paths: Richard Feynman's Curious Life*****.**

EDUCATIONAL OFFERINGS

GUIDED TOUR
Feynman believed in a process of observations and experimentation for which he had an insatiable curiosity. Join our guided tour to peer into the mind of this inspiring Nobel Prize Laureate and discover how his thinking has provided the starting point for some of the most exciting ideas in science today.

WORKSHOP: 'FEYN' OUT ABOUT NANO!
Explore the wonders of the nano world in this hands-on workshop. Work with your friends to find the micro-letters in our daily lives and have a go at 'decoding the quote' from your friend!

For school group enquiries, please email **MuseumGroupBooking@MarinaBaySands.com** for more information.