# 天文 X STEM

## 中天訓 WORKSHOP 4

PREPARED BY RAVEN LAU

DATE: MARCH 15, 2018

# OUTLINE

Demo/Experiment

Workshop

Stargazing

Talk/booth

Sharing

# DEMO/ EXPERIMENT

## COMET

在實驗室裏製作彗星

## ASTRONOMICAL PHENOMENA

模擬各種天文現象：月亮盈虧、日 / 月全蝕……

## STARRY NIGHT

星空模擬

## ASTROPHYSICS

協助同學去理解較抽象的物理理論：超新星爆炸、重力……

# COMET

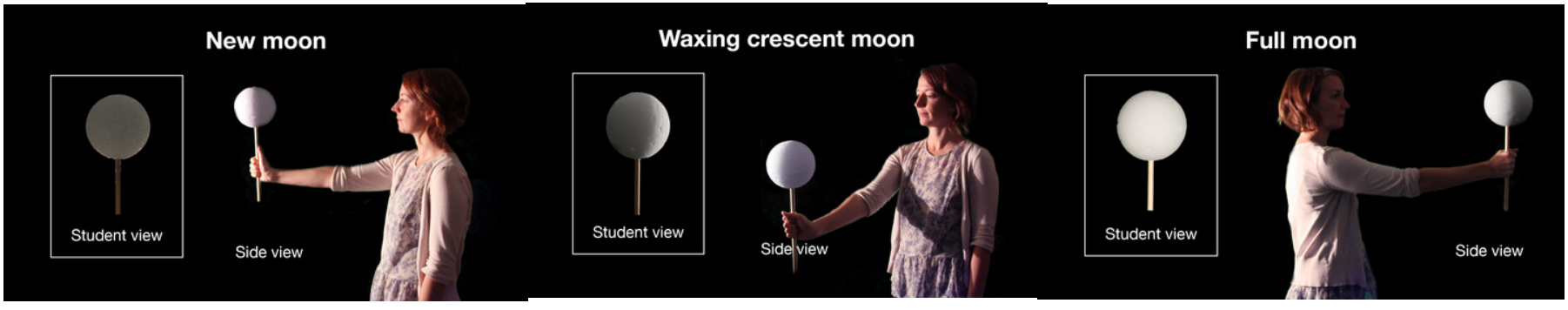
WARNING

## 注意事項

實驗中會使用到乾冰，因此必須有老師在場。

# ASTRONOMICAL PHENOMENA

## 月亮盈虧




## 月 / 日全食

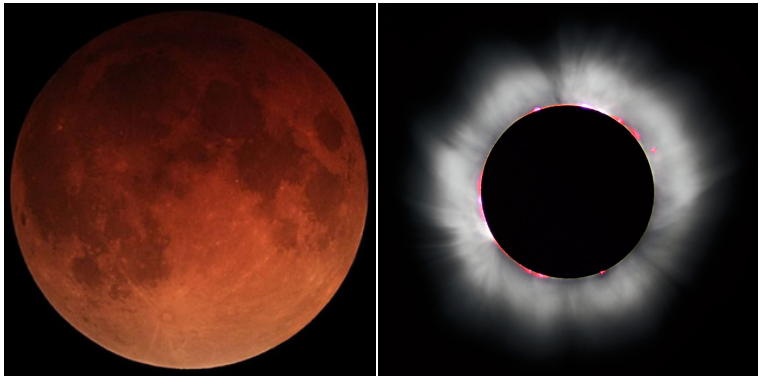


photo: science in school

# STARRY NIGHT

## 數碼立體星象館

REMIND

### 溫馨提示

星象館可向香港太空館，可觀自然教育中心□天文館借用。記得留意星象館大小是否能於校內場地安置。

# STARRY NIGHT

## stellarium

INTRODUCTION

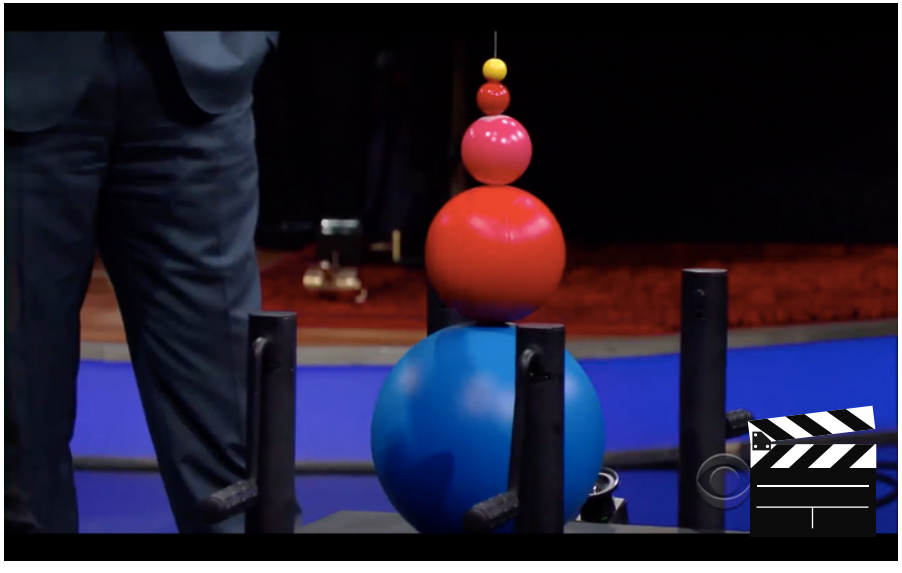
### 軟件介紹

電腦版是免費的。可模擬當晚及不同日子的星空，包括特別的天文現象，例如凌日，日食等等（彗星除外）。此外，可以放大觀察不同行星，深空天體。

# ASTROPHYSICS

## 重力

## 超新星



REMIND

### 溫馨提示

有些同學比較不擅長理解較抽象的物理概念，利用實驗 / 示範去協助同學理解相關理論是較好的方法。

# WORKSHOP

## SUN FUNNEL

自製太陽濾光片及投影儀

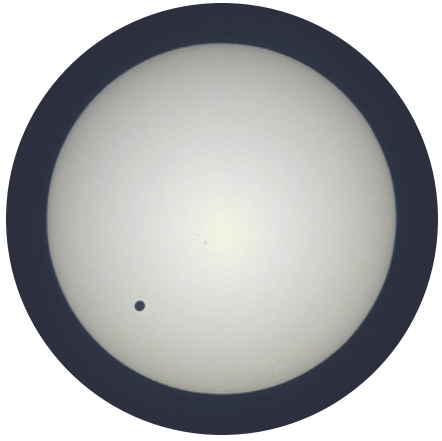
## PAPER MODEL

用紙製作跟天文相關的模型，例如太空望遠鏡、行星等等

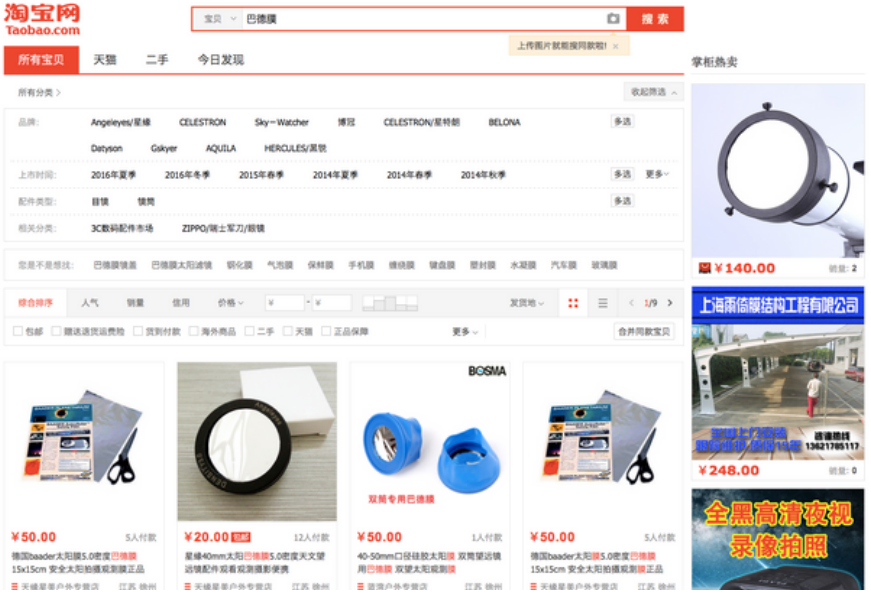
## REFRACTING TELESCOPE

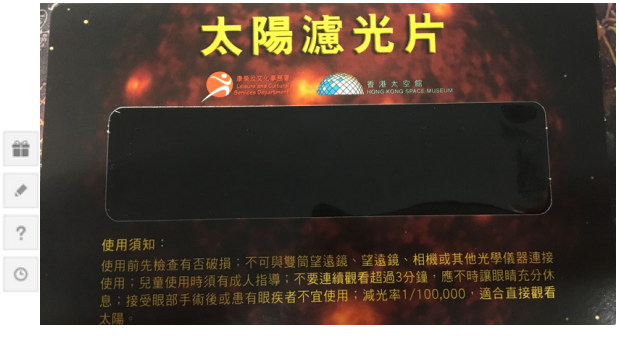
製作伽利略望遠鏡，從中明白折射式望遠鏡的原理

# SUN FUNNEL



## 太陽濾光片 / 巴德膜



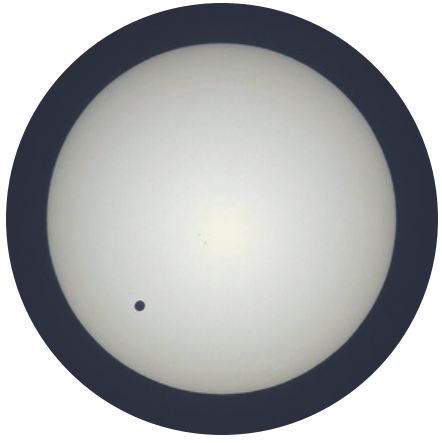



REMIND

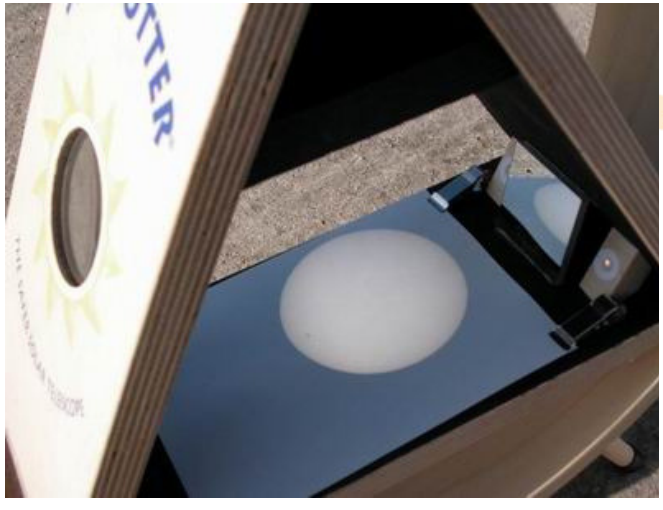
### 溫馨提示

訂購巴德膜時要注意密度，5.0才是適合用作肉眼觀測。使用前檢□有沒有漏光情況。

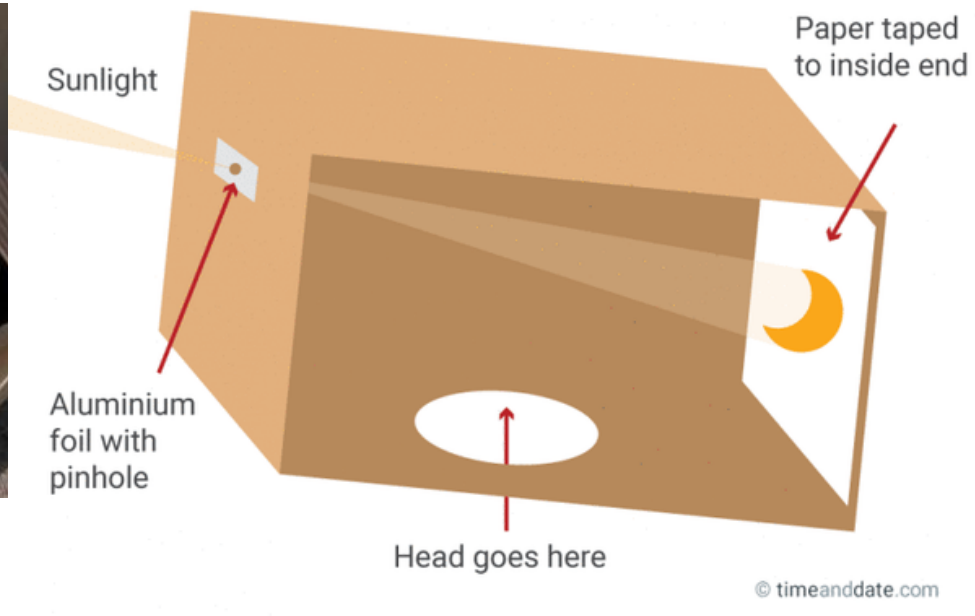
# SUN FUNNEL



## 投影儀



## 針孔投影儀

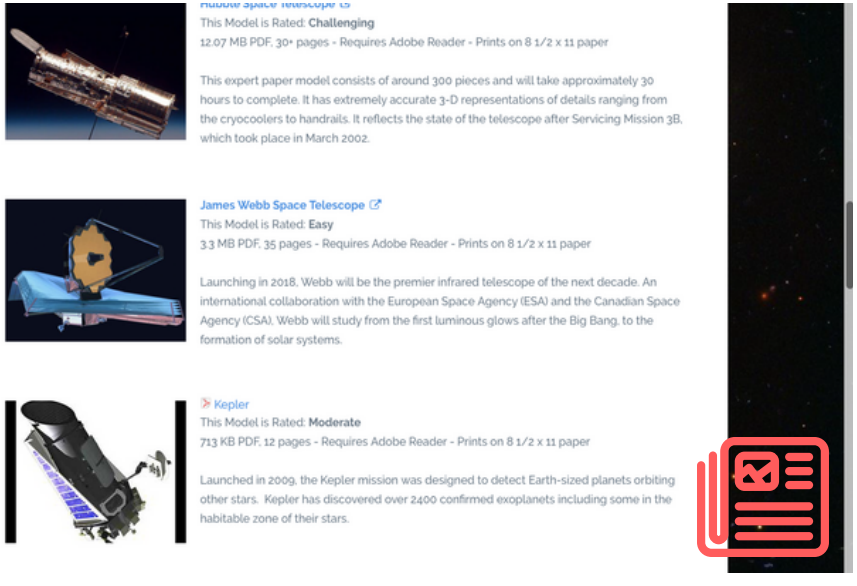



credit: timeanddate.com

# PAPER MODEL

## 紙模型製作

香港太空館：天文資訊：教育資源：下載製作紙




NASA paper models

REMIND

### 溫馨提示

利用像卡紙這種較厚的紙來製作紙模型效果更佳。每個模型製作時間和難度均不同，最好活動前先自行製作一次。

# REFRACTING TELESCOPE

## 製作折射式望遠鏡

INTRODUCTION

### 工作坊介紹

折射式望遠鏡結構較簡易，適合協助中學生去理解望遠鏡原理。製作後可讓同學利用望遠鏡眺望遠的景物，明白折射式望遠鏡的優缺點（如色差）。

# STARGAZING

## NAKED-EYE OBSERVATION

普通單憑肉眼觀察

## THROUGH TELESCOPE

透過雙筒 / 各式天文望遠鏡去觀察

# NAKED-EYE OBSERVATION

## 星座

credit：staples

INTRODUCTION

### 觀星介紹（1）

活動前準備當晚星空會出現甚麼較顯眼的星座。除了指出星座的形狀之外可準備一些相關的神話故事，令同學留下較深刻印象。講星的同時用指星筆會更好。

# NAKED-EYE OBSERVATION

## 觀星軟件

Sky Chart

Star walk

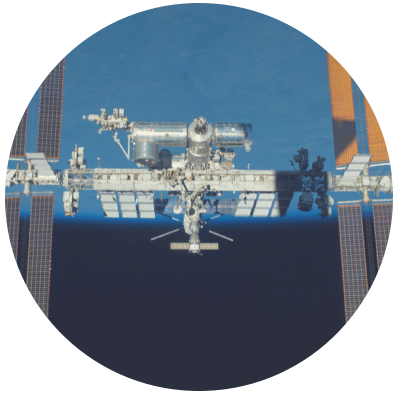
INTRODUCTION

### 觀星介紹（2）

推介同學下載觀星軟件，方便同學辨認星座。

# NAKED-EYE OBSERVATION

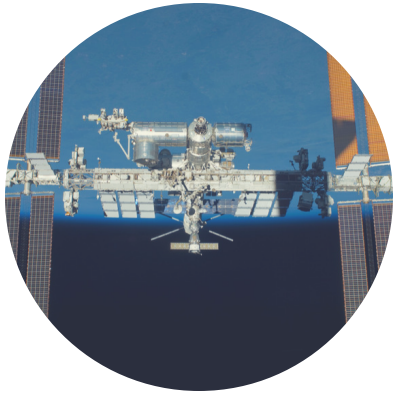
## 人造衛星



Calsky

# NAKED-EYE OBSERVATION

## 國際太空站（ISS）



**Saturday 24 March 2018**

| Time (24-hour clock) | Object (Link) | Event |
|---|---|---|
| 10h57m36.36s | ISS | **Close to Moon**. Separation=0.405° Position Angle=306.1°, Position angle vertex=233.1°<br>Angular diameter=67.2" size=109.0m x 73.0m x 27.5m<br>Satellite at Azimuth=258.4° WSW Altitude= 80.8° Distance=411.1 km **Magnitude=-3.9mag**<br>In a clock-face concept, the satellite will seem to move toward 1:14<br>Angular Velocity=61.3'/s<br><br>**Centerline, closest point** →Map: Longitude=114°07'41"E Latitude=+22°18'28" (WGS84) **Distance=2.92 km**<br>Azimuth=309.6° NW Path direction= 39.6° NE ground speed=7.425 km/s width=6.1 km max. duration=0.5 s<br>Sun altitude=-6° Elongation from Sun=87°<br>Orbit source: NASA predicted orbit |
| 10h57m43s | ISS →Ground track →Star chart | **Appears 10h52m24s 0.8mag az:220.2° SW horizon**<br>**Culmination 10h57m43s -4.0mag az:309.6° NW h:84.2°**<br>**distance: 408.1km height above Earth: 406.1km elevation of Sun: -6° angular velocity: 1.11°/s**<br>**at Meridian 10h57m50s -4.0mag az: 0.0° N h:80.9°**<br>**Disappears 11h03m04s -0.7mag az: 39.3° NE horizon** |

**Sunday 25 March 2018**

| Time (24-hour clock) | Object (Link) | Event |
|---|---|---|
| 11h42m05s | ISS →Ground track →Star chart | **Appears 11h37m39s 2.6mag az:261.1° W horizon**<br>**Culmination 11h42m05s -0.1mag az:317.8° NW h:11.5°**<br>**distance: 1373.3km height above Earth: 407.2km elevation of Sun: -16° angular velocity: 0.33°/s**<br>**at Meridian 11h44m48s -0.6mag az: 0.0° N h:5.6°**<br>**Disappears 11h46m31s -0.3mag az: 14.5° NNE horizon** |

**Monday 26 March 2018**

| Time (24-hour clock) | Object (Link) | Event |
|---|---|---|
| 10h49m43s | ISS →Ground track →Star chart | **Appears 10h44m42s 2.0mag az:243.0° WSW horizon**<br>**Culmination 10h49m43s -1.0mag az:314.0° NW h:23.6°**<br>**distance: 891.5km height above Earth: 406.5km elevation of Sun: -4° angular velocity: 0.51°/s**<br>**at Meridian 10h51m37s -1.5mag az: 0.0° N h:14.8°**<br>**Disappears 10h54m46s -0.5mag az: 25.1° NNE horizon** |

**Tuesday 27 March 2018**

| Time (24-hour clock) | Object (Link) | Event |
|---|---|---|
| 11h07m59s | ISS | Orbit maneuver rocket burn<br>(CalSky takes this burn into account for pass predictions) |

# NAKED-EYE OBSERVATION

## □衛星 (Iridium satellites)

calsky.com

你所有的設計 – Canva | 簡報 – Lake Granada, Canada | "Beauty And A Beat" - Justin Bieber (Alex Goot, Kurt Sch... | Artificial Satellites > (Iridium) Flares

| | | |
|---|---|---|
| | | a successful observation (Object/site coordinates/date/measured time/accuracy/magnitude). |
| 22h22m46s | Terra SAR X | Flare from SAR-Panel, left-looking **Magnitude= 0.6mag**<br>Azimuth= 84.9° E altitude= 52.1° in constellation Delphinus<br>Flare angle=10.97°<br>Flare center line, closest point →MapIt: Longitude=115.425°E Latitude=+22.089° (WGS84)<br>**Distance=133.1 km** Azimuth= 99.5° E Peak Magnitude=-3.0mag<br>Satellite above: longitude=117.6°E latitude=+22.4° height above Earth=511.6 km distance to satellite=634.1 km<br>Altitude of Sun=-2.2°<br>This is an experimental flare prediction. Brightness estimate may be unreliable. Please report a successful observation (Object/site coordinates/date/measured time/accuracy/magnitude). |
| 22h23m12s | TanDEM-X | Flare from SAR-Panel, left-looking **Magnitude= 0.3mag**<br>Azimuth= 84.7° E altitude= 53.1° in constellation Delphinus<br>Flare angle=10.14°<br>Flare center line, closest point →MapIt: Longitude=115.319°E Latitude=+22.106° (WGS84)<br>**Distance=122.0 km** Azimuth= 99.5° E Peak Magnitude=-3.0mag<br>Satellite above: longitude=117.5°E latitude=+22.4° height above Earth=512.7 km distance to satellite=628.7 km<br>Altitude of Sun=-2.1°<br>This is an experimental flare prediction. Brightness estimate may be unreliable. Please report a successful observation (Object/site coordinates/date/measured time/accuracy/magnitude). |

**Monday 19 March 2018**

| Time (24-hour clock) | Object (Link) | Event |
|---|---|---|
| 11h51m41s | Iridium 68 | **Flare from MMA2 (Left antenna) Magnitude=-4.9mag**<br>**Azimuth= 12.6° NNE altitude= 35.1° in constellation Draco**<br>**Flare angle=0.39°**<br>Flare center line, closest point →MapIt: **Longitude=114.234°E Latitude=+22.288° (WGS84)**<br>**Distance=8.7 km Azimuth= 92.1° E Peak Magnitude=-6.8mag**<br>**Satellite above: longitude=116.2°E latitude=+30.2° height above Earth=780.5 km distance to satellite=1233.9 km**<br>**Altitude of Sun=-18.8°** |
| 21h53m09s | COSMO-SkyMed 3 | **Flare from SAR-Panel Magnitude=-0.4mag**<br>**Azimuth=126.7° SE altitude= 80.8° in constellation Hercules**<br>**Flare angle=7.65°**<br>Flare center line, closest point →MapIt: **Longitude=113.326°E Latitude=+22.131° (WGS84)**<br>**Distance=86.6 km Azimuth=258.3° WSW Peak Magnitude=-2.7mag**<br>**Satellite above: longitude=114.9°E latitude=+21.8° height above Earth=624.7 km distance to satellite=632.0 km**<br>**Altitude of Sun=-8.9°**<br>**This is an experimental flare prediction. Brightness estimate may be unreliable. Please report a successful observation (Object/site coordinates/date/measured time/accuracy/magnitude).** |

14 Items/Events: Export to Outlook/iCal Print

# THROUGH TELESCOPE

## 雙筒望遠鏡

credit: leisurelyscientist.com

INTRODUCTION

### 觀星介紹（3）

雙筒望遠鏡很適合觀星初學者去使用。可先跟同學教學使用雙筒望遠鏡的技巧。購買時要留意是否有濾鏡。可用指星筆輔助同學找到觀察目標。

# THROUGH TELESCOPE

## 天文望遠鏡

星雲

行星

月球

INTRODUCTION

### 觀星介紹（4）

行星比較容易透過望遠鏡觀察，可留意最近有沒有行星出現。不建議在滿月時觀察月球，因為不容易看到月球上的坑紋。觀察月球時最好先安置濾鏡，以免眼睛受到傷害。

# TALK/BOOTH

REMIND

溫馨提示

論座的內容自行決定，可多留意同學有興趣的課題。
內容不要過多，同學未必能消化。

# TALK/BOOTH

資料來源……

WIKIPEDIA
The Free Encyclopedia

NASA

REMIND

溫馨提示

不要直接抄襲。

# SHARING

PREPARED BY RAVEN LAU

DATE: MARCH 15, 2018