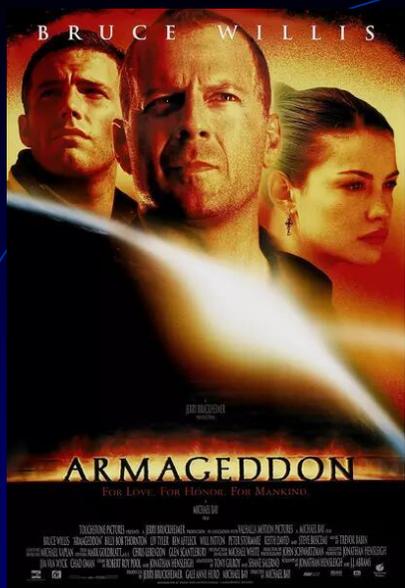
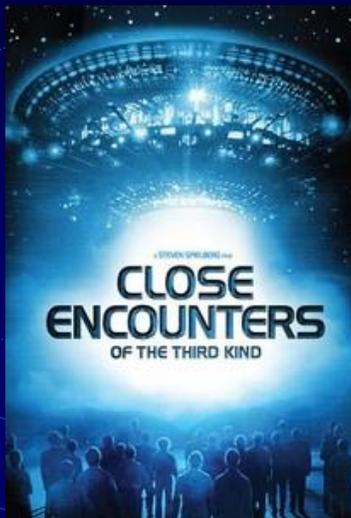


讀懂電影中的太空科學



世界末日



第三類接觸



地心引力



星際效應



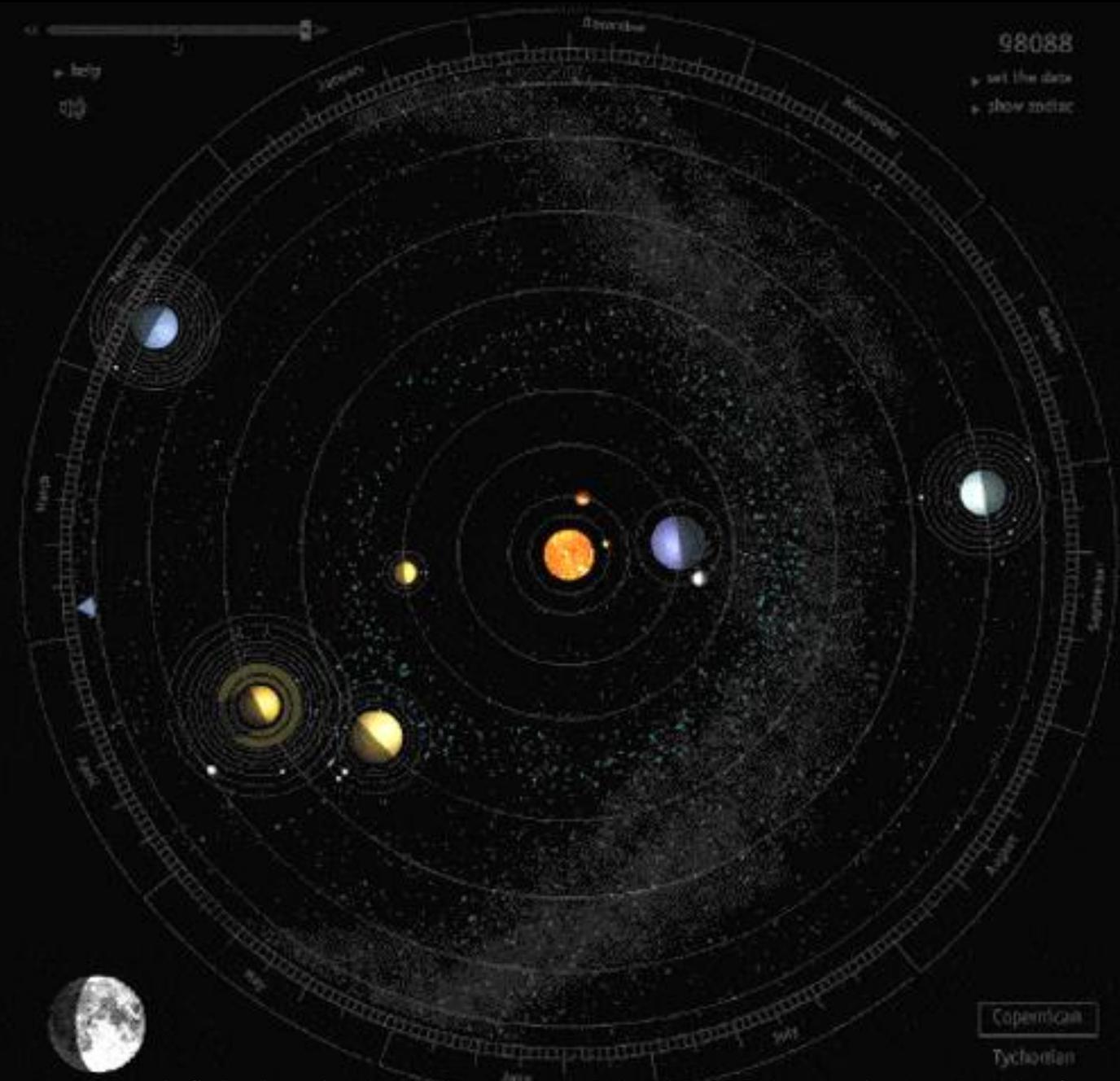
絕地救援

陳文屏
中央大學 天文所

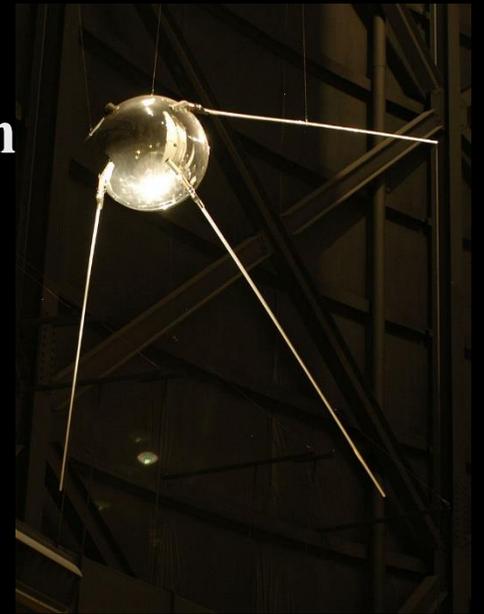
物理——「東西的道理」 運動、能量、力量
化學——「東西的本質」 物質組成、結構、變化，
生物——「某種特殊東西」的結構、功能、演化
歷史——「事情的來龍去脈」 過往的紀錄
地理——「周遭的環境」 地形、地貌、居住者

對象是宇宙、天體 → **天文學**

問天大的問題



第一個人造衛星
Sputnik 1，直徑58 cm
1957年10月4日升空



從火星看地球與月球

星系

恆星（行星、衛星、彗星）、
星際物質、磁場、暗物質



M51 螺旋星系

A deep-field astronomical image showing a dense field of galaxies. The galaxies are in various stages of evolution, appearing as small, distant points of light in various colors including blue, orange, and red. Some are bright and clear, while others are faint and blurry. The background is a dark, starry space.

目前看到最遠
(也就是最早)
的宇宙

某些紅色小星
系誕生於大霹
靂之後8億年

目前知道

- 太陽與地球於約50億年前從一團星際雲氣中誕生，太陽還可以存活50～70億年
- 太陽系有八顆行星，其中只有地球有生命存在
- 銀河系當中有超過千億顆恆星
- 太陽周圍數千顆恆星旁邊也有行星，更遠的仍待偵測
- 宇宙創生於137億年前，當中有千億個星系
- … 以上這些怎麼知道的？宇宙將來會怎樣？其他地方有沒有生命？有沒有另外個宇宙？如何知道答案？

電影與科學

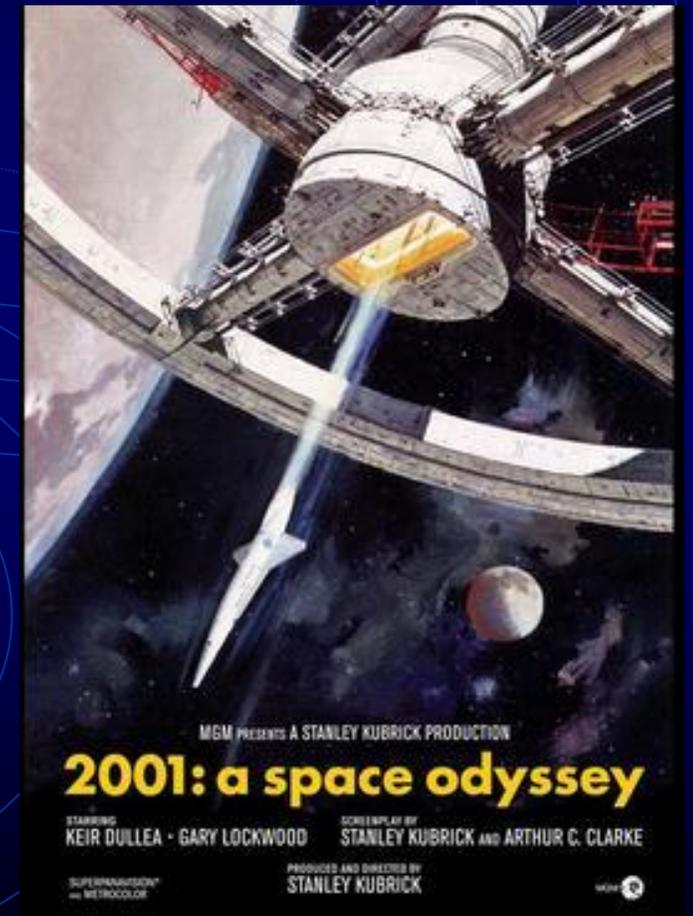
- 看電影是娛樂，「好看」最重要
(劇情、攝影、顏質高、道具優 ...)
- 科幻電影好看，因為有部分科學真實 **(有科)**
Armageddon (世界末日), Deep Impact (彗星撞地球),
Gravity (地心引力), Interstellar (星際效應),
The Martian (絕地救援)
- 科幻電影好看，因為並非全都是科學真實 **(有幻)**
- 看科幻電影的樂趣之一是發掘其不科學之處！

2001 太空漫遊 *2001: A Space Odyssey* (1968)

Arthur C. Clarke (1948 story)

某個高等文明似乎發射訊號到木星，於是人類派遣太空船前往探索，航程中電腦發現太空人打算將其關閉，而展開制約行動，設計殺害太空人... 最後主角到達木星，卻經歷快速老化，而又幻化成嬰兒，飄浮在太空...

壯麗的配樂、充滿哲學的內容

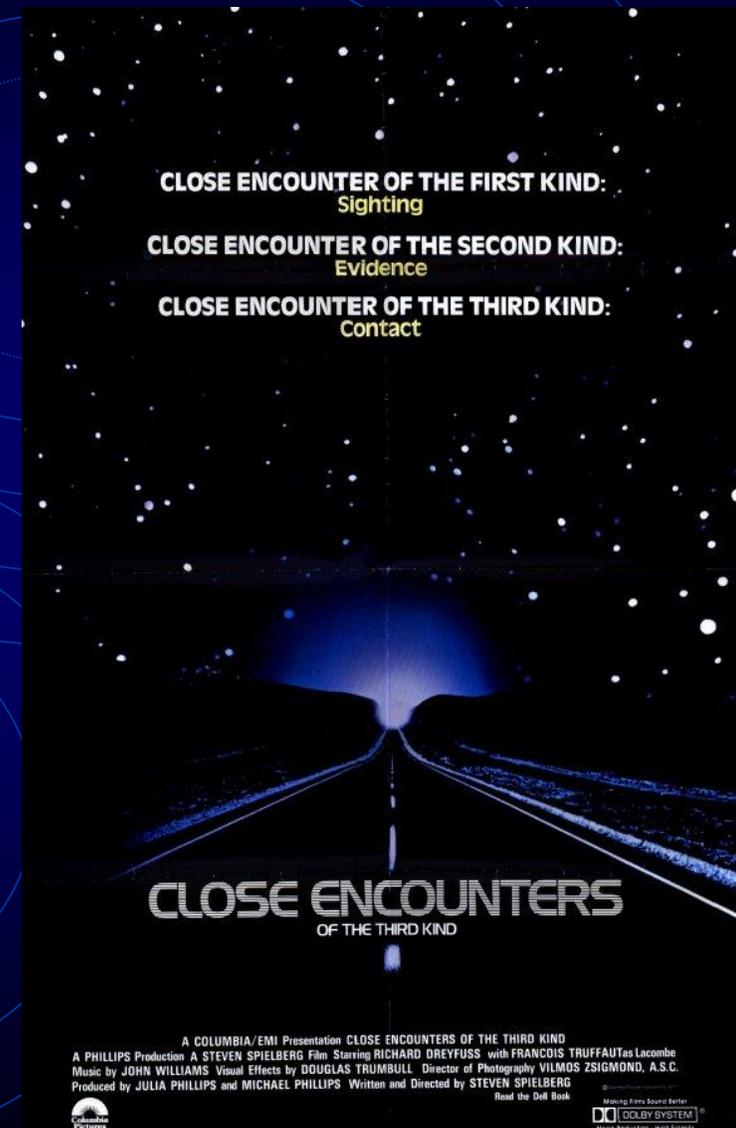


第三類接觸 *Close Encounter of the Third Kind* (1977)

人類終於跟外星人不僅止於「看到」（第一類）UFO，或有證據（第二類），而是實際接觸（第三類），會是怎麼樣的情景？

2007年被美國國會圖書館認為「具備文化、歷史以及美學上的成就」

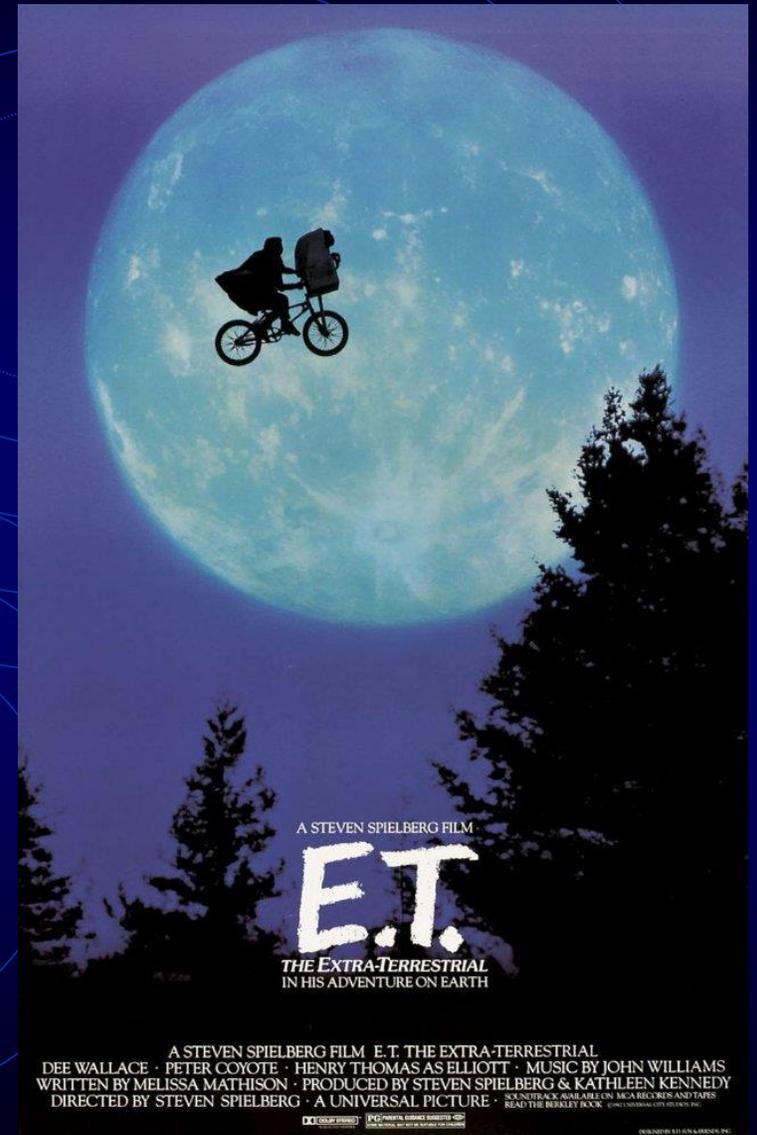
2017年發行4K版40週年重製版



外星人 *E.T. the Extra-Terrestrial* (1982)

兄妹兩人如何瞞着母親以及政府，幫助流落在地球而想家的外星人回家？

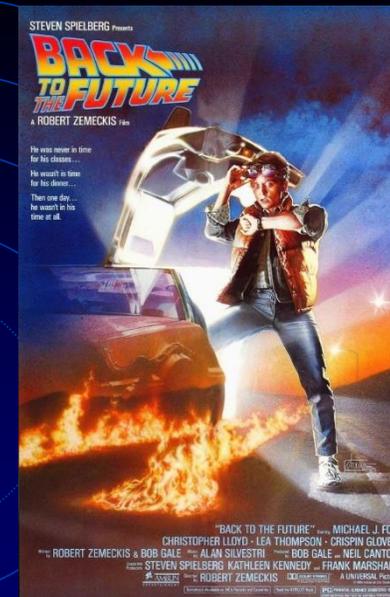
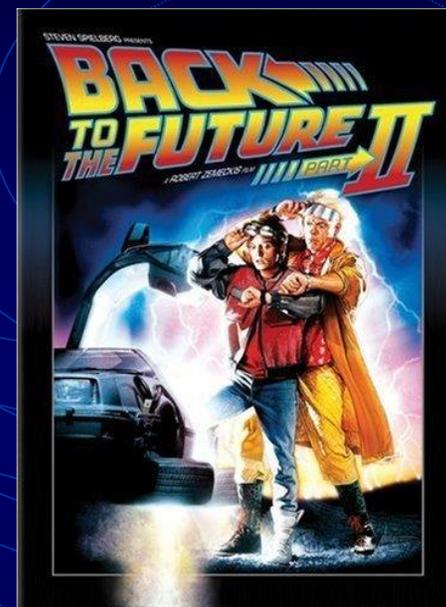
溫馨得不得了（獲得四項奧斯卡獎），沒有科學又何妨？可以是動物園跑出的動物，逃犯～



回到未來 *Back to the Future* (1985, 1989, 1990)

高中生主角乘坐時光機從1985年回到1955年，卻讓年輕的母親一見鍾情。要如何讓父母重浴愛河，並且回到「未來」呢？

Back to the Future 4 (2018)

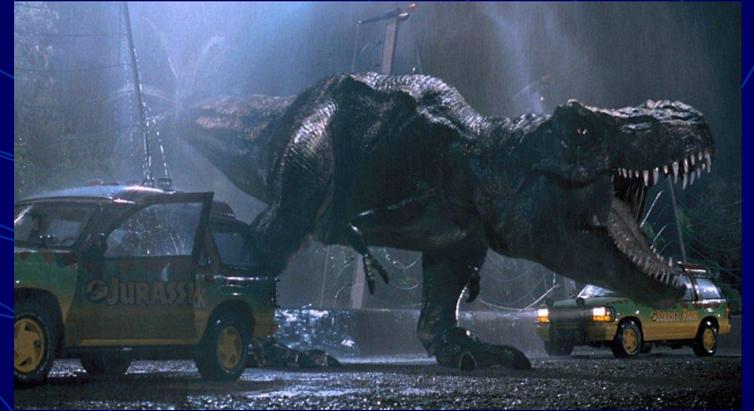


侏羅紀公園 *Jerassic Park* (1993、1997、2001、2015)

考古挖掘到嵌藏了蚊子的琥珀，由於該蚊子曾經叮咬恐龍，因而藉由恐龍基因而使其復活...

經典科幻電影；電影特效里程碑

要是你會怎麼做？



接觸未來 *Contact* (1997)



Jodie Foster as “Ellie” in
Contact (接觸未來，1997)



If we are alone in the Universe, then it is an awful waste of space.

— Carl Sagan

要是宇宙中只有我們，那真是太浪費空間了。
— 卡爾·沙岡



接觸未來 vs 回到未來



時間似乎有個方向，過去在我們後面，已經無法改變，
... 而未來則在我們前方 ...
過去或未來可以改變，可以聯絡嗎？

時間逆轉的矛盾

時光機這個東西～

Grandfather paradox (祖父矛盾)

- 如果某人利用時光機回到過去，把他的祖母殺死了，當時她還沒有遇見你的祖父…
- 那，他根本就不可能存在，還坐時光機 …

Autoinfanticide /autofanticide (自謀矛盾)

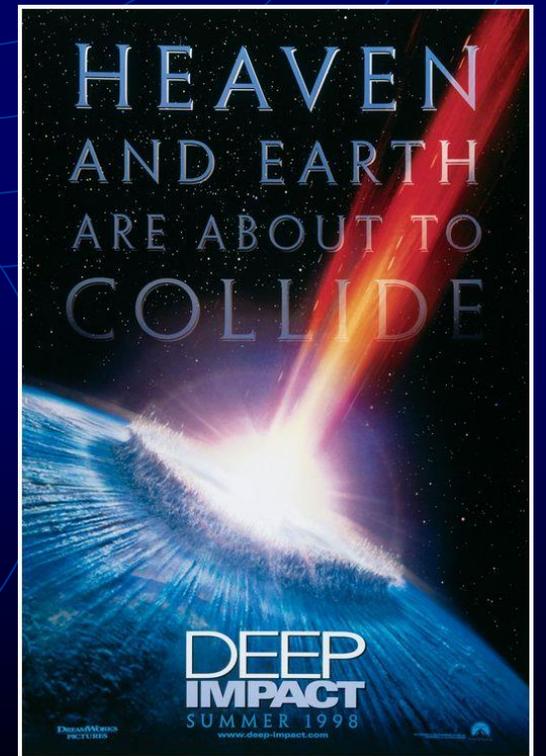
- 如果回到過去，卻殺死了嬰兒時期的自己 …

我們其實不太瞭解「時間」這個東西！

彗星撞地球 *Deep Impact* (1998)

美國中學生發現一顆特殊星體，結果是顆將撞擊地球的彗星。記者調查美國財政部長辭職案，發現部長與 Elie 有關。結果那並非情婦，而是 E.L.E. (extinction-level event) ...

彗星約11公里大，足夠毀滅地球文明，造成生物大滅絕美、俄決定啓動秘密研發的太空船 Messiah 號，攜帶核子彈摧毀彗星... 彗星沒有被摧毀，而是分裂成兩半，地球成立避難所，美國政府舉辦抽籤選取80萬平民，以及20萬科學家、工程師、藝術家、軍人、政府官員...







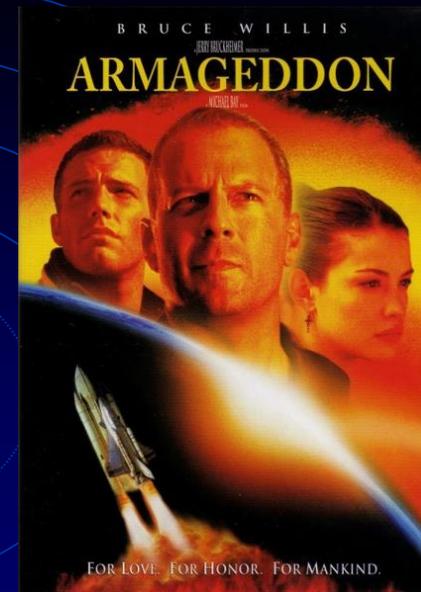
2個半月之後

世界末日 *Armageddon* (1998)

小行星將撞擊地球，NASA技窮，找一批鑽井工人前往登陸小行星爆破。NASA用這部電影當作訓練教材，找出錯誤之處，共找到近200個

Armageddon 希伯來語，意為「四周環山之地」，為猶太教預言世界末日的戰場，Messiah (Jesus Christ) 將會回來，在 Armageddon 的戰鬥中擊敗反基督者。此字可延伸，例如美國總統歐巴馬描述2010年2月侵襲華盛頓特區的暴風雪為 Snowmageddon

兩部電影影評差不多。科學家普遍認為「彗星撞地球」在科學細節上準確些，但「世界末日」票房好得多





2012 (2009)

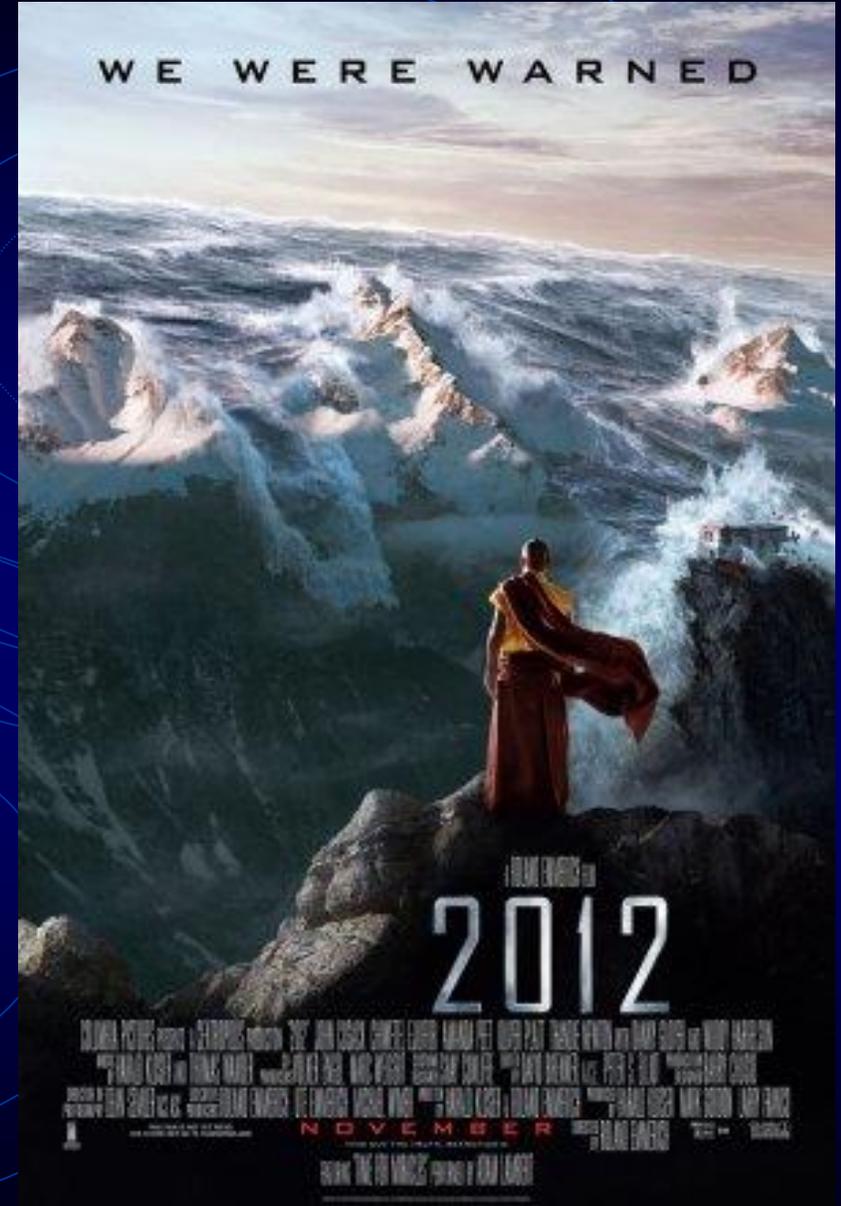
根據馬雅預言，地球末日將於
2012年降臨... 太陽風暴、全球
火山爆發、超級地震、地磁逆轉

中國與G8各國安排「諾亞方舟」
試圖保存人類一線生機

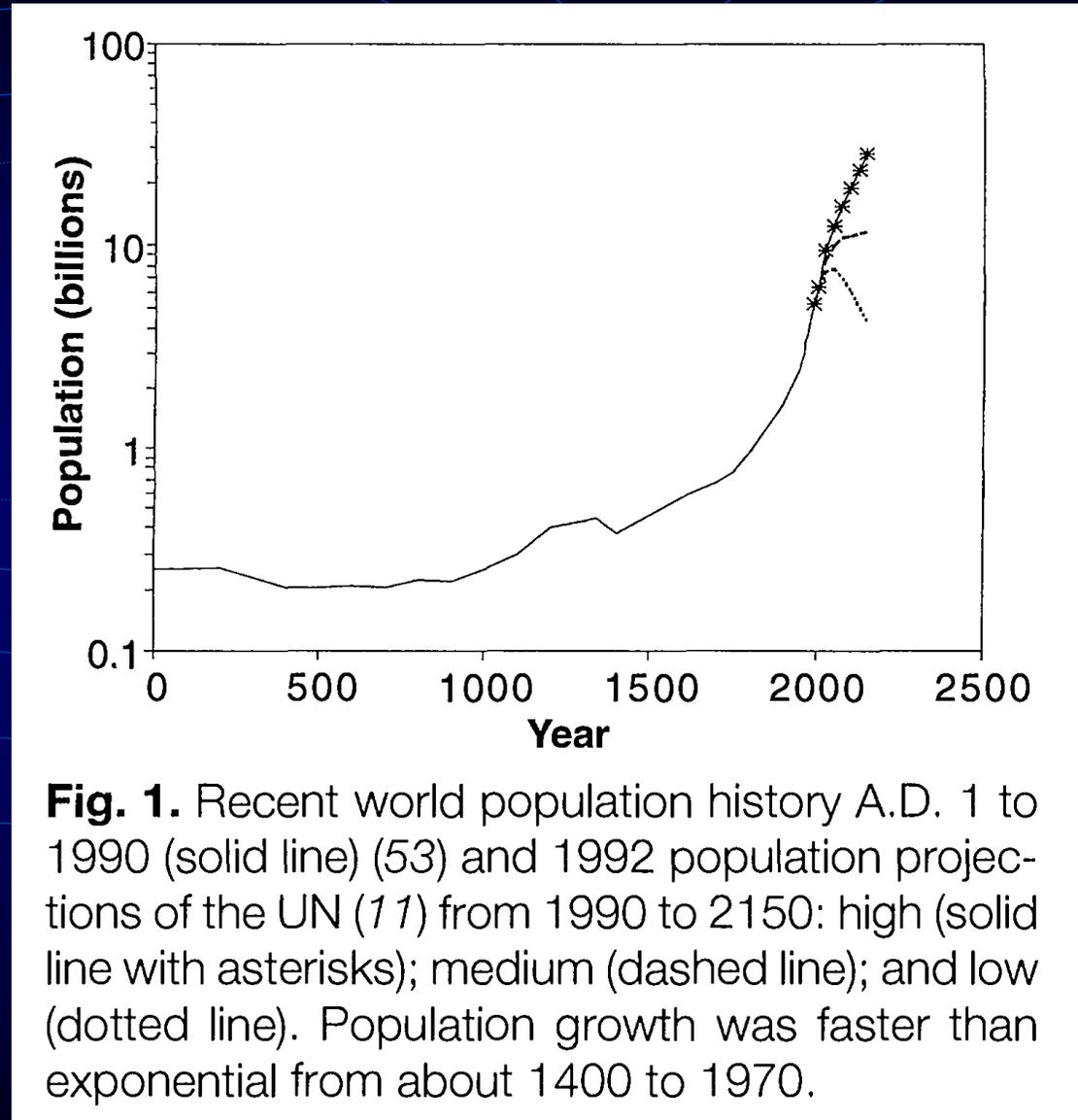
災難片甚於科幻片

曆法週期性結束？

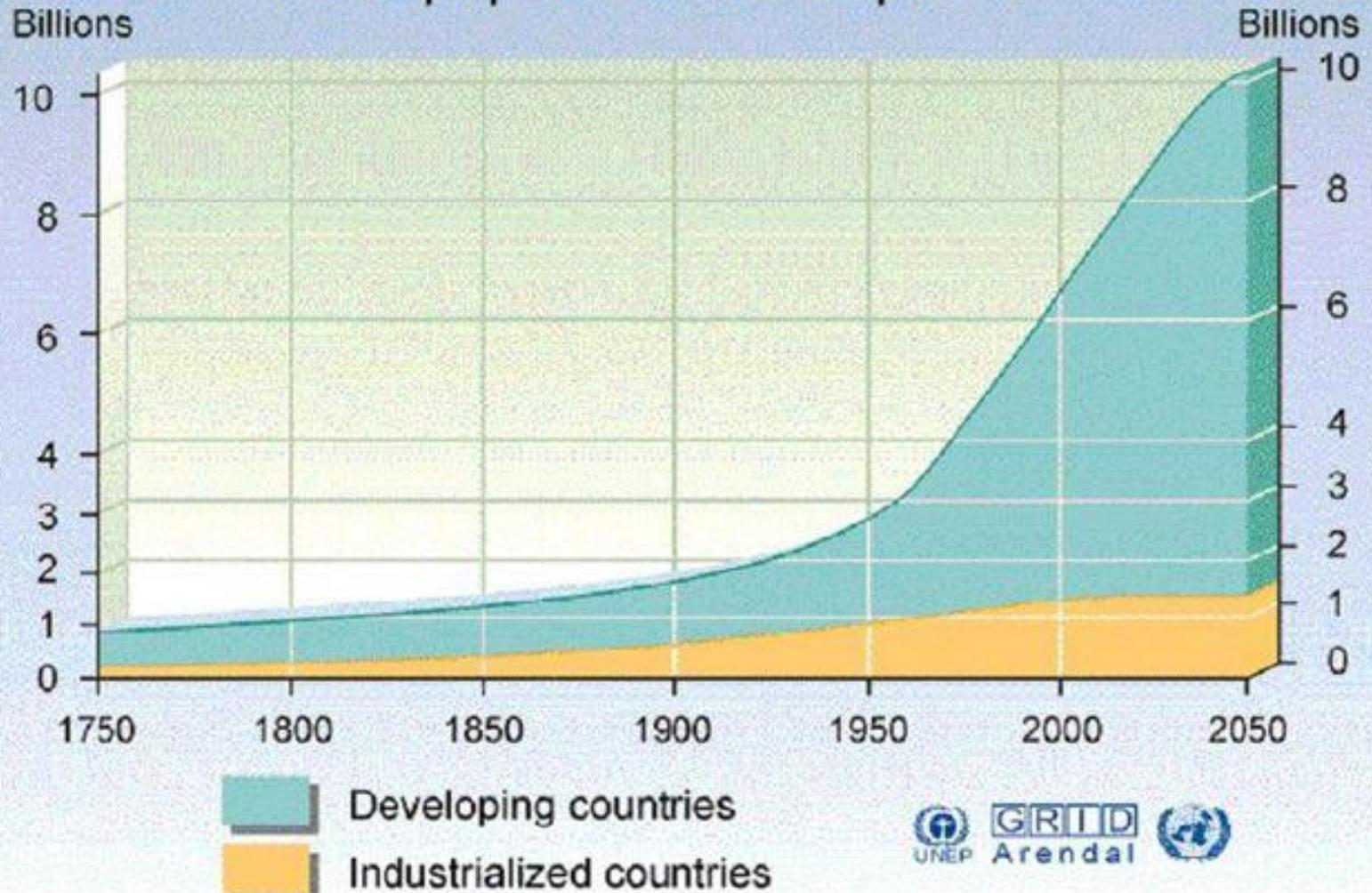
北韓杯葛這部電影，因為2012年是金日成百
年冥誕，怎麼會是世界末日？



全球人口在1400年與1970年間呈倍數增加

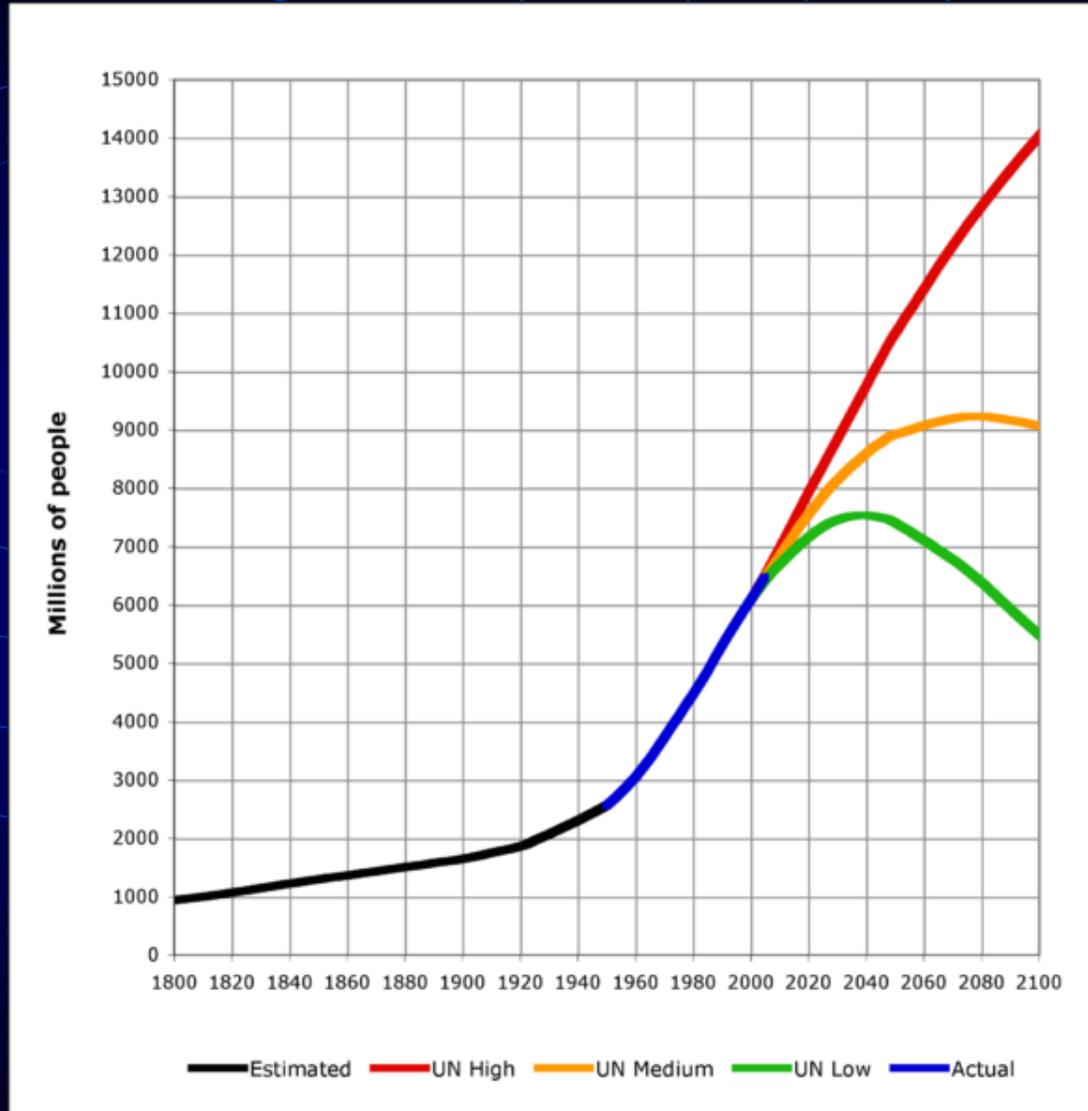


World population development



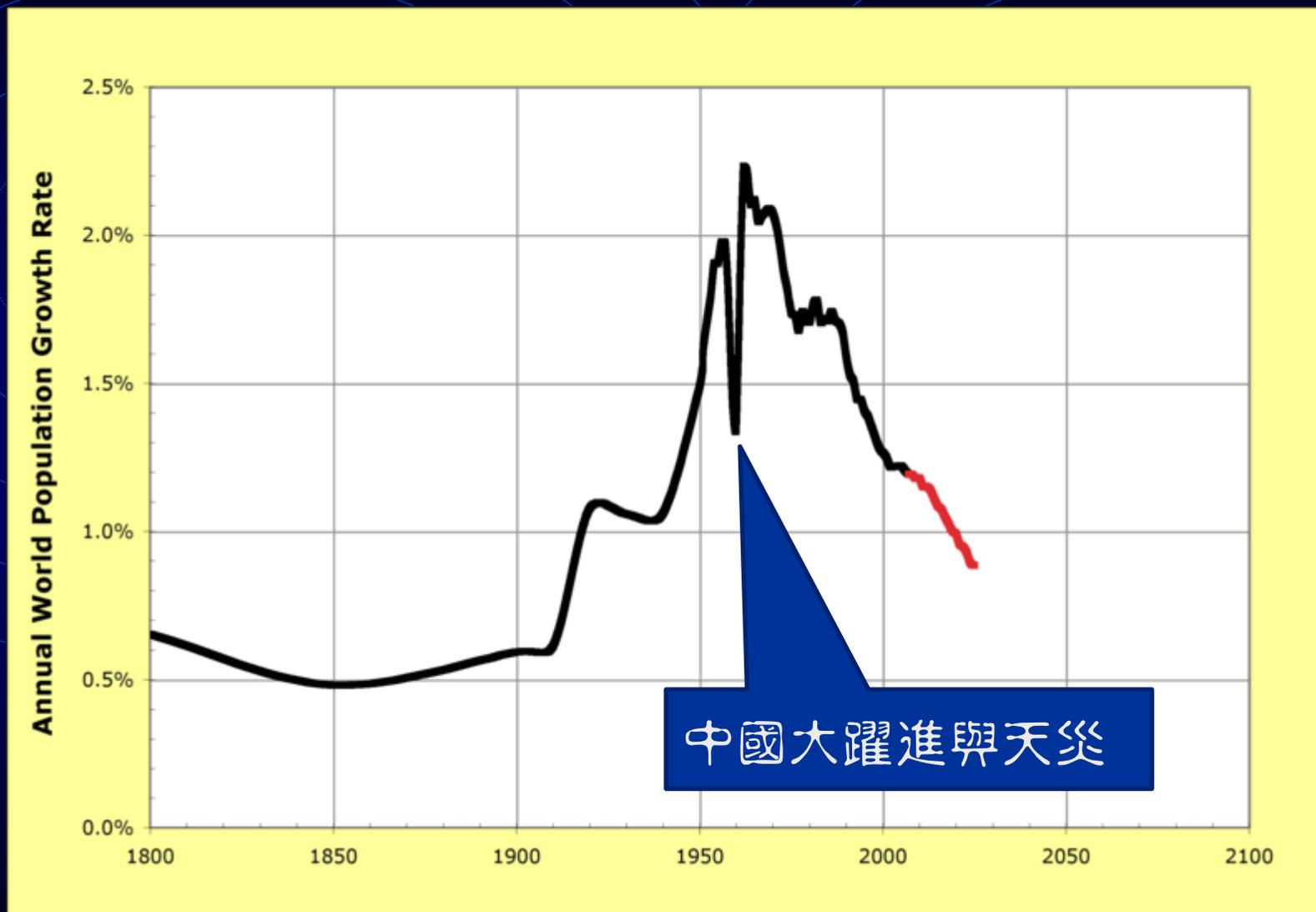
<http://www.treehugger.com/World-Population-Growth-2050.JPG>

全球人口可能在2040年與2070年間達到極大



1798 Thomas Malthus
馬爾薩斯「人口論」
中的災難？

但是「年成長率」逐漸下降





World agriculture 2030: Global food production will exceed population growth

Food security and environmental problems will remain serious in many countries - new FAO study

ROME, 20 August 2002 -- Globally there will be enough food for a growing world population by the year 2030, but hundreds of millions of people in developing countries will remain hungry and many of the environmental problems caused by agriculture will remain serious, according to the summary report of "World agriculture: towards 2015/2030", a study launched by the UN Food and Agriculture Organization (FAO).

Population growth will slow down and many people will be better fed. As a result, the growth in demand for food will be lower. The pressure emanating from agriculture on natural resources will continue to increase, but at a slower pace than in the past.

For many of the currently more than 1.1 billion people that are living in extreme poverty, economic growth based primarily on agriculture and on non-farm rural activities is essential to improve their livelihoods. The majority of the poor live in rural areas. Promoting agricultural growth in rural areas and giving rural people better access to land, water, credit, health and education, is essential to alleviate poverty and hunger.

International trade plays an important role in improving food security and further agricultural trade liberalization could boost incomes. FAO projects that the agricultural trade deficit of the developing countries will increase drastically over the period to 2030. The report calls for better access to OECD markets, the elimination of export subsidies and the reduction of tariffs, in particular on processed agricultural goods, in both developed and developing countries. In addition, where it is still the case, developing countries should stop to discriminate against their agriculture in national policy making.

The benefits of globalization in food and agriculture could outweigh the risks and costs. For example, globalization has generally led to progress in reducing poverty in Asia. "But it has also led to the rise of multinational food companies with the potential to disempower farmers in many countries. Developing countries need the legal and administrative framework to ward off the threats while reaping the benefits." Openness towards international markets, investments in infrastructure, the promotion of economic integration and limits on market concentration, could make globalization work for the benefit of the poor.

Related links

- Jelle Bruinsma, Global Perspectives Studies Unit, comments on the report. In RealAudio, duration: 2min49sec
- Jelle Bruinsma, Global Perspectives Studies Unit, comments on the report. In mp3, duration: 2min49sec
- Click here for the main results of the report
- World Agriculture: Towards 2015/2030 - Summary report
- Interview with Jelle Bruinsma, Global Perspectives Studies Unit
- The State of Food Insecurity in the World 2001
- The State of World Fisheries and Aquaculture 2000
- Aquaculture in the Third Millennium
- Global forest resources assessment 2000
- The State of the World's Forests 2001
- Agro-Ecological Zoning System (AEZ)
- Biotechnology in Food and Agriculture
- For more information please contact Erwin Northoff, FAO Information Officer, tel. (+39) 06 5705 3105

How to download / listen audio clips

Information for journalists

[Newsroom]

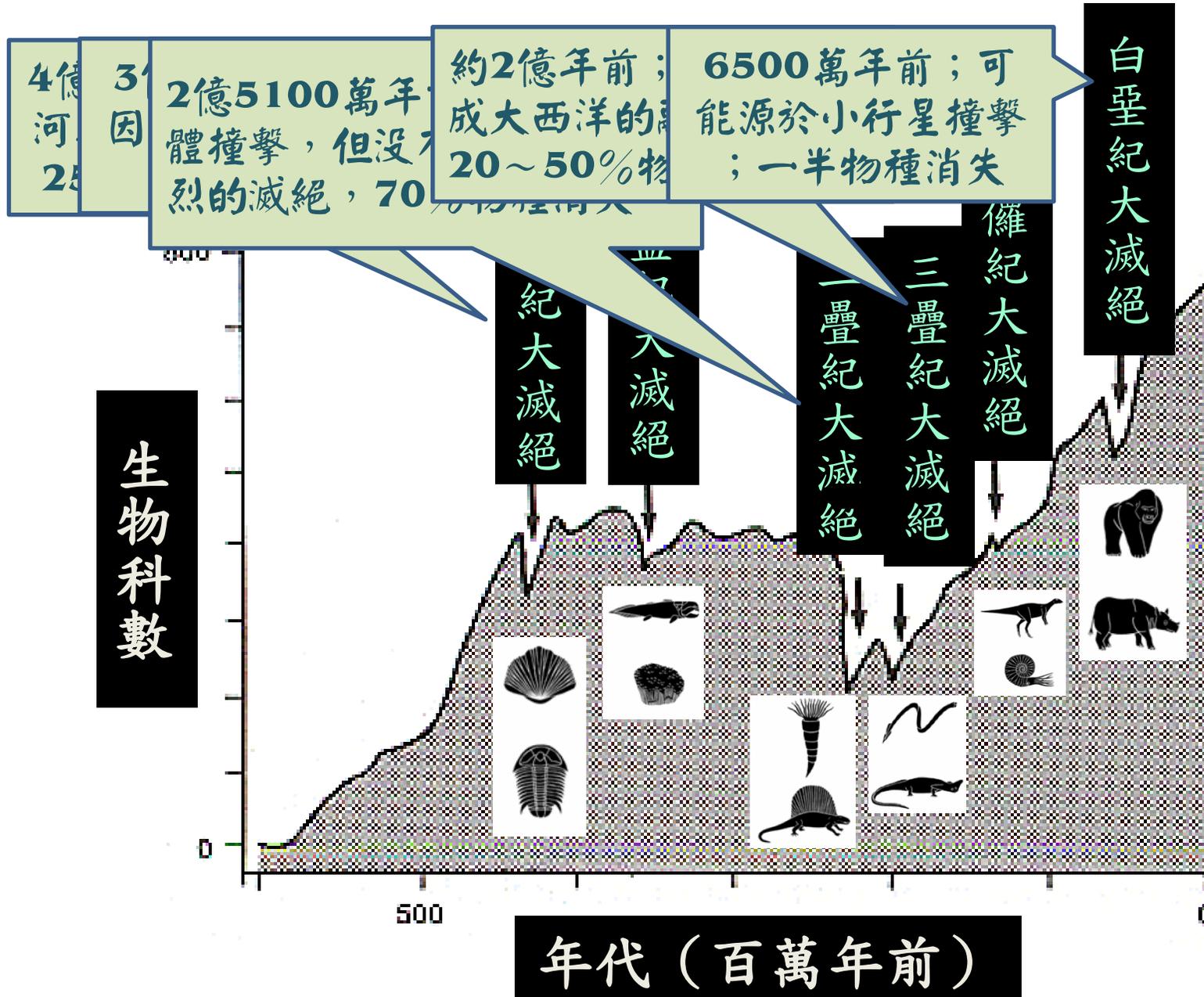
- Media contacts
- Meetings calendar
- Online photos
- From the Director-General

- News stories
- Focus on the issues
- Press releases
- News & highlights
- News briefs
- Photo file
- Fact file
- Global watch

以致於聯合國組織預測，由於人口增長減緩，到2030年食物供給將過剩。事實上我們也越吃越少。所以吃不是問題。

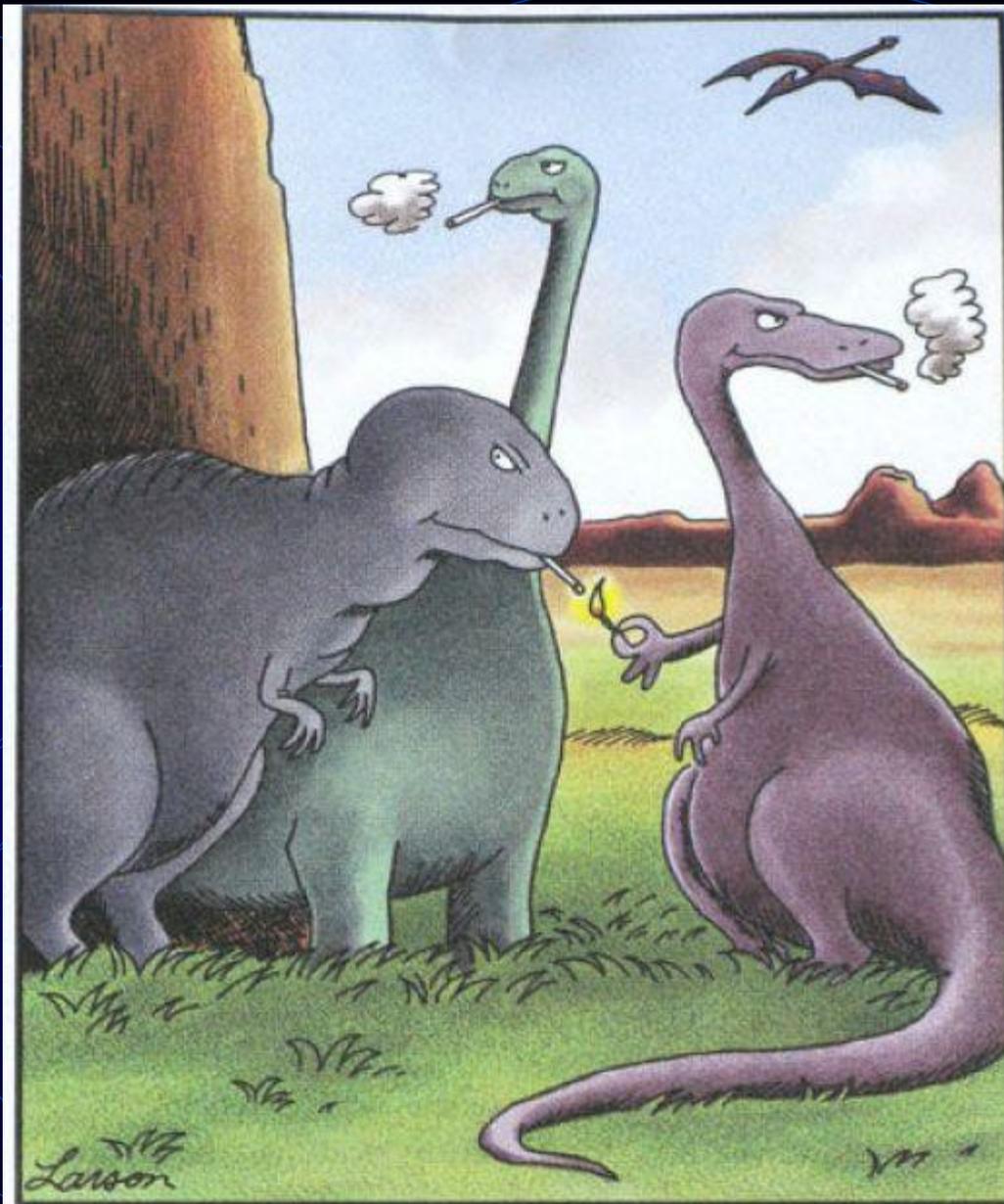
真正的危機是能源、水資源... (的分配)

生物史中重大的滅絕事件



恐龍滅絕 ...

的真正原因



The real reason dinosaurs became extinct

By Gary Larson

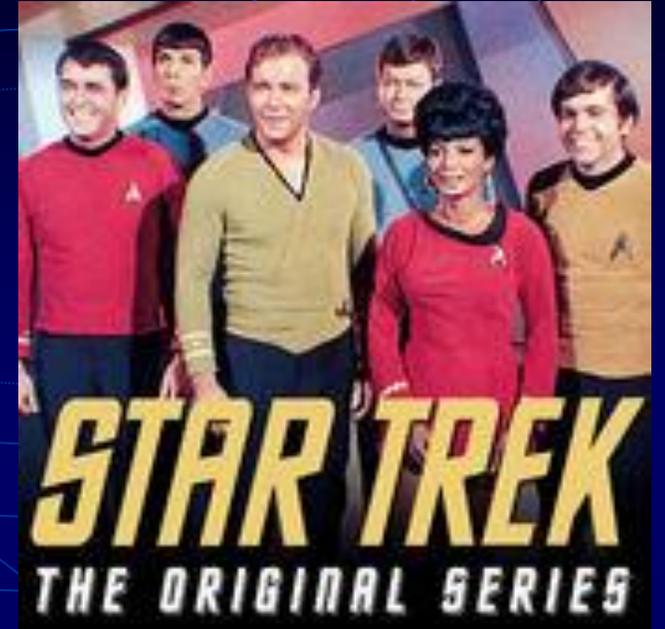
星際爭霸戰 *Star Trek*

電視影集 (1966-1969; 2017-; 電影 ...

艦長 James T. Kirk 率領「企業號」
(Enterprise) 隊員的太空探險故事

Star Trek TOS *Space: the final frontier. These are the voyages of the starship Enterprise. Its five-year mission: to explore strange new worlds, to seek out new life and new civilizations, to boldly go where no man has gone before.*

Star Trek TNG *Space: the final frontier. These are the voyages of the starship Enterprise. Its continuing mission: to explore strange new worlds, to seek out new life and new civilizations, to boldly go where no one has gone before.* Monolog



星際爭霸戰 *Star Trek: Discovery* (2017)



<https://www.youtube.com/watch?v=oWnYtyNKPsA>

Opening

星際大戰 *Star Wars*

STAR WARS

電影系列（1977起）...



在很久以前，一個遙遠的銀河系，肩負正義使命的絕地武士與帝國邪惡黑暗勢力作戰的故事。絕地武士是一群有着非凡天賦的人，經由各種篩選，他們在幼年即開始接受嚴格特殊訓練，其宗旨是認識和使用「原力」(Force)。訓練有素的絕地武士有極強的意志力可以使用無所不在的「原力」來維護銀河系的和平。
(引自 wikipedia)



星際大戰八部曲：最後的絕地武士 (2017)

Star War 8:
Final Trailer

來來來，來找碴

太空中沒有空氣，爆炸有光沒有聲音，不會「迸！」

太空並非真空，其實有介質，但密度極低

太空船轉向也不必傾斜

躲子彈？躲雷射槍？閃避成群的小行星

外星人沒道理對地球這麼有興趣

通常時間與大小（距離）尺度都不對

Martian
SEX AND THE CITY[®]



慾望

火星？

城市

火星？

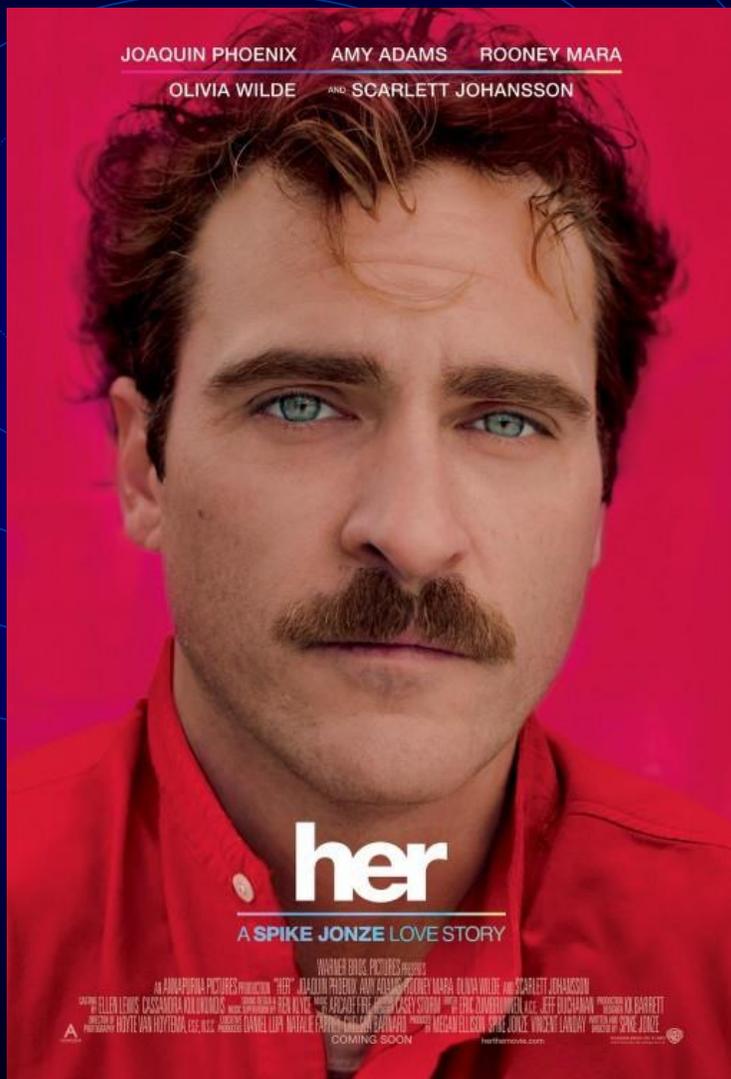
黃昏三鏢客



雲端情人 *Her* (2013)

無關太空，
不算科幻片
一名男子與
人工智慧開
發出的女性
發出的女性
聲音之間的
浪漫關係。

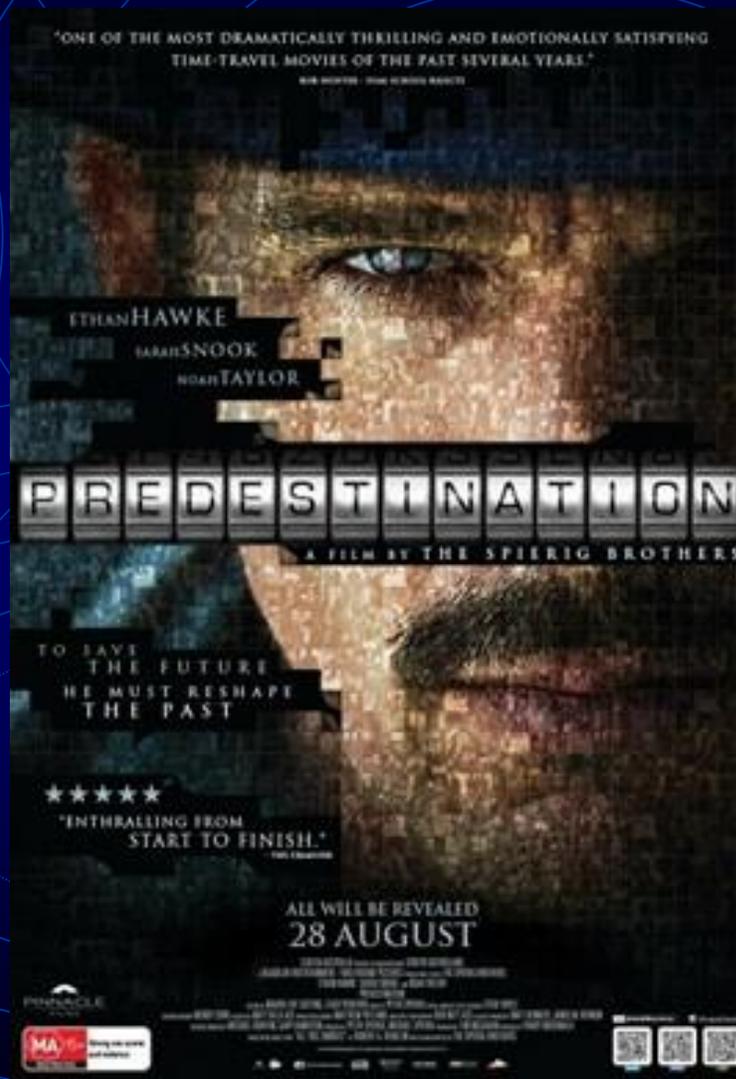
浪漫電影



超時空攔截 *Predestination* (2014)

(澳洲) 穿
越時空的情
報員試圖解
除炸彈失敗
而毀容...

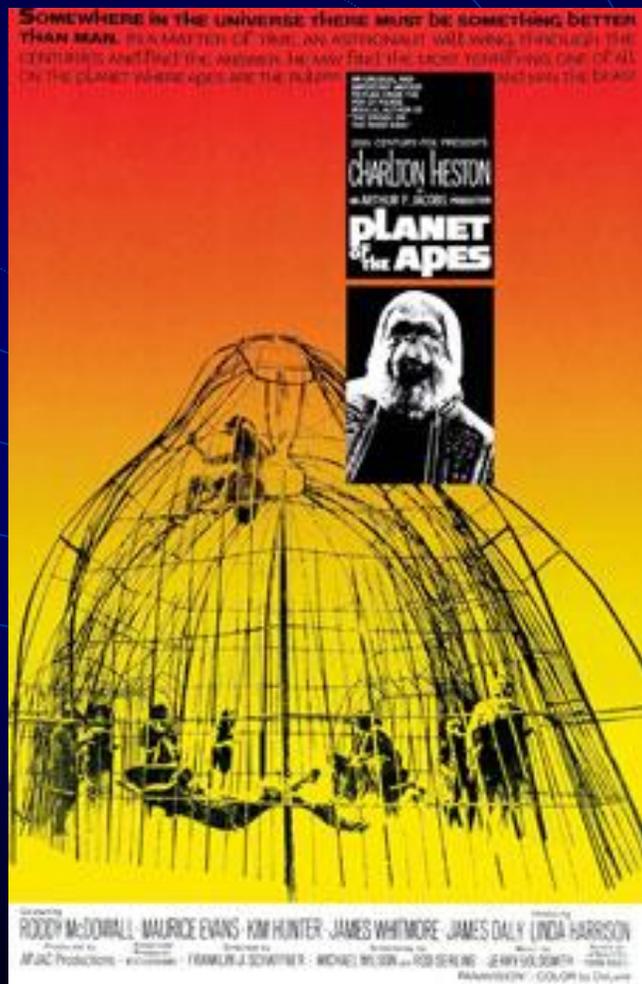
奇幻電影



劇情複雜

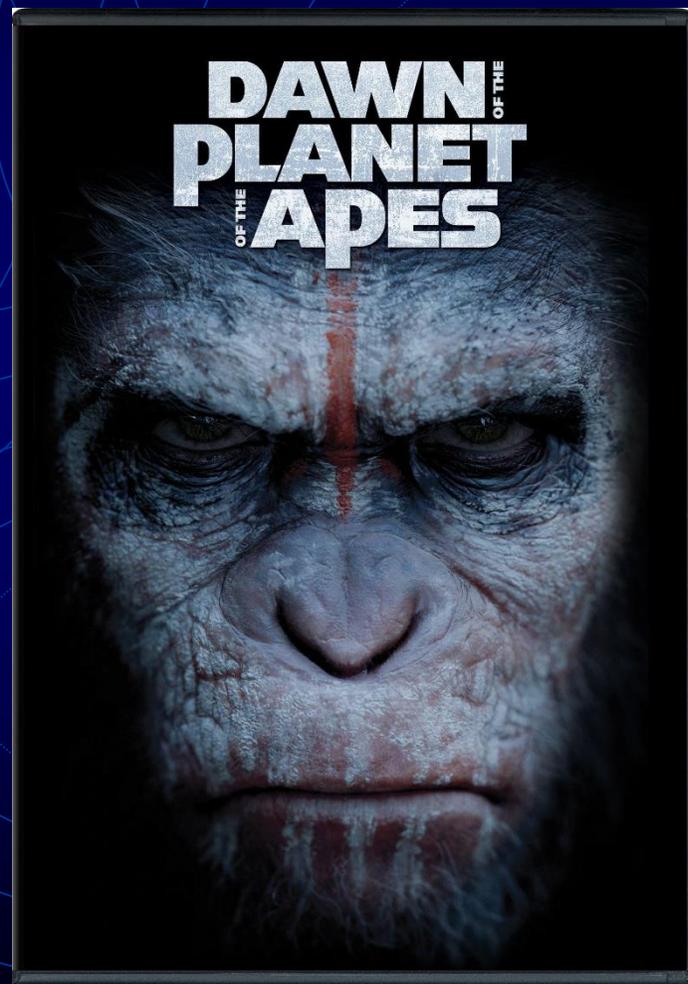
浩劫餘生 Planet of the Apes (1968)

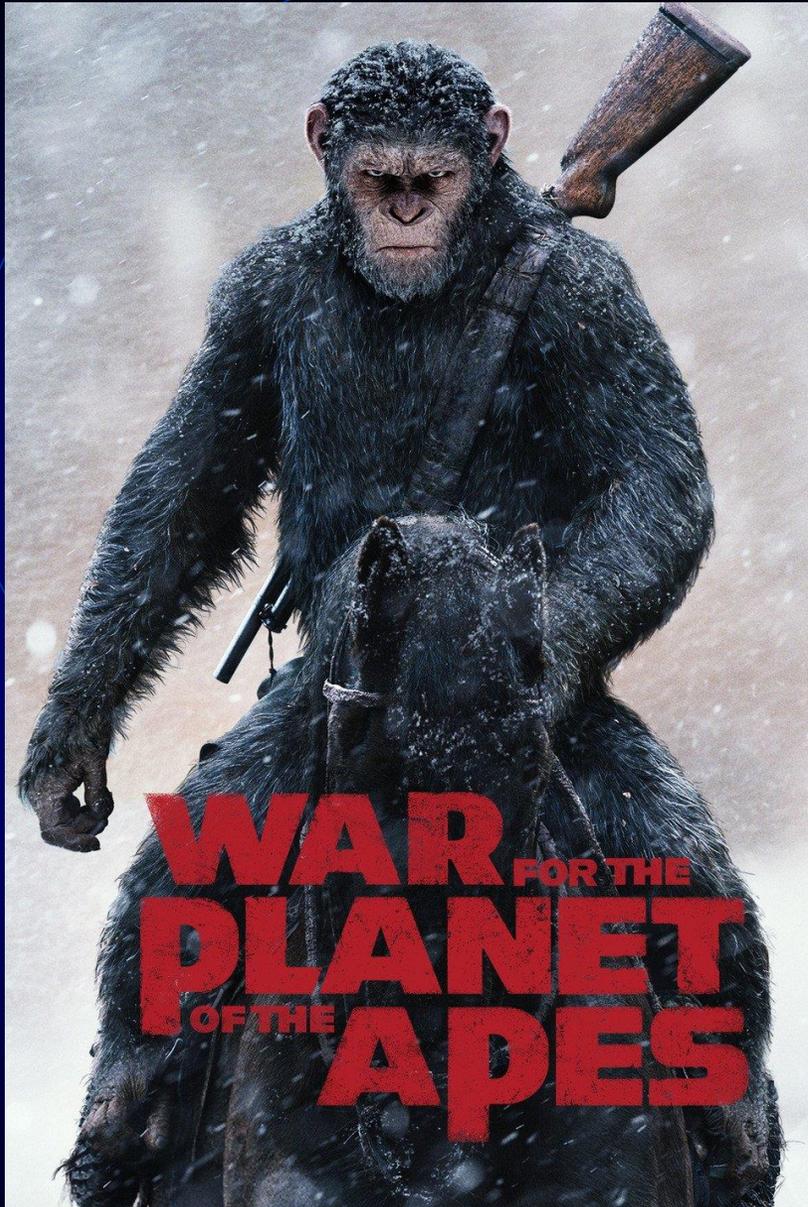
沈睡的太空人突然醒來，因為太空船迫降在遙遠的未來，某個由人猿主宰的行星，人類則是「畜生」



猩球黎明 Dawn of the Planet of the Apes (2014)

人類開發治療阿茲海默症的藥物，造成實驗猩猩用藥後智商大幅提升，使得城市大亂，也引發「猿流感」... 十年之後





猩球崛起：終極決戰

War for the Planet of the Apes
(2017)

猿流感十五年後，與人類（殘存）
軍隊 AΩ 的戰爭



<https://www.youtube.com/watch?v=qxjPjPzQ1iU>

地心引力 *Gravity* (2013)

美國太空梭探索者號在太空執行修理哈伯望遠鏡的任務期間意外毀壞，在太空尋求回家的方案 ●●

基本上鏡頭前只有兩名演員

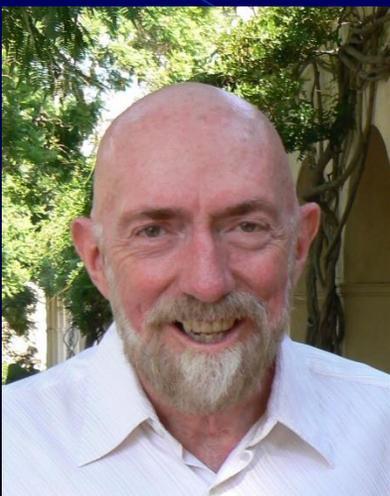
俄國是壞蛋，中國是救星

<https://www.youtube.com/watch?v=OiTiKOy59o4>



星際效應 *Interstellar* (2014)

未來地球已不適人居，人類爲了生存，由一群太空人打先鋒，穿越蟲洞尋找淨土
提名四項奧斯卡獎項；獲得最佳視覺效果
普受好評，特效一流，尤其有科學根據

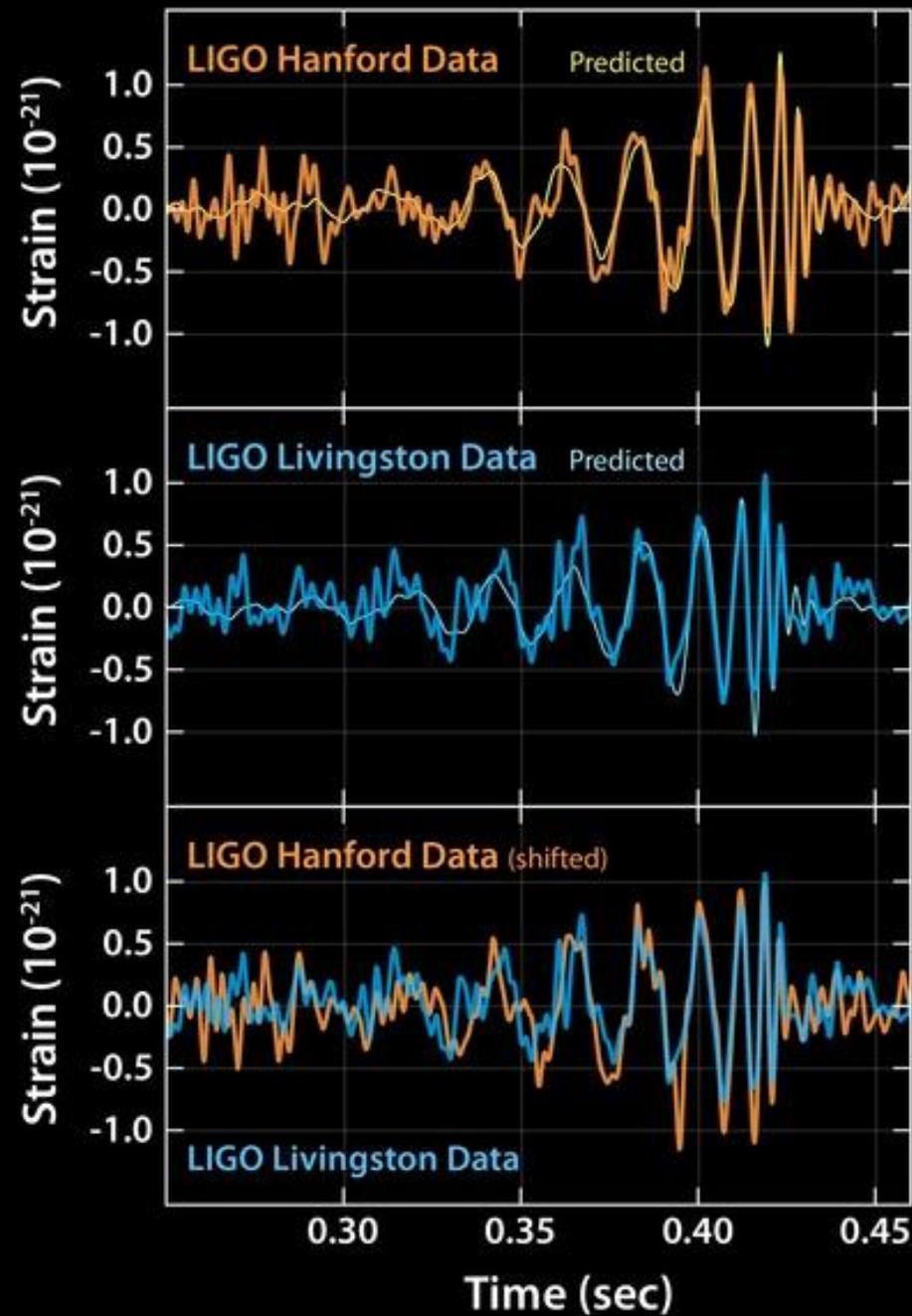


理論天文物理學家 **Kip Thorne**
是本片科學顧問，也是執行製作人。**2017年物理諾貝爾獎得主。**





百年前愛因斯坦廣義相對論就已經預測重力波存在
重力波很微弱，只有極端變化，例如極緻密的黑洞或中子星合併訊號才夠強



"For the greatest benefit to mankind"
Alfred Nobel



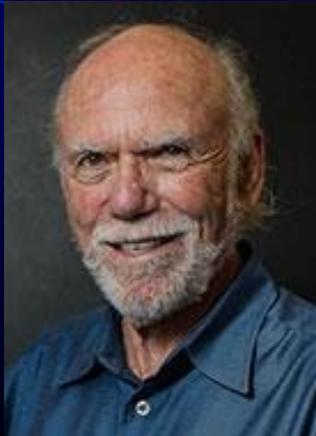
The Royal Swedish Academy of Sciences has decided to award the

2017 NOBEL PRIZE IN PHYSICS

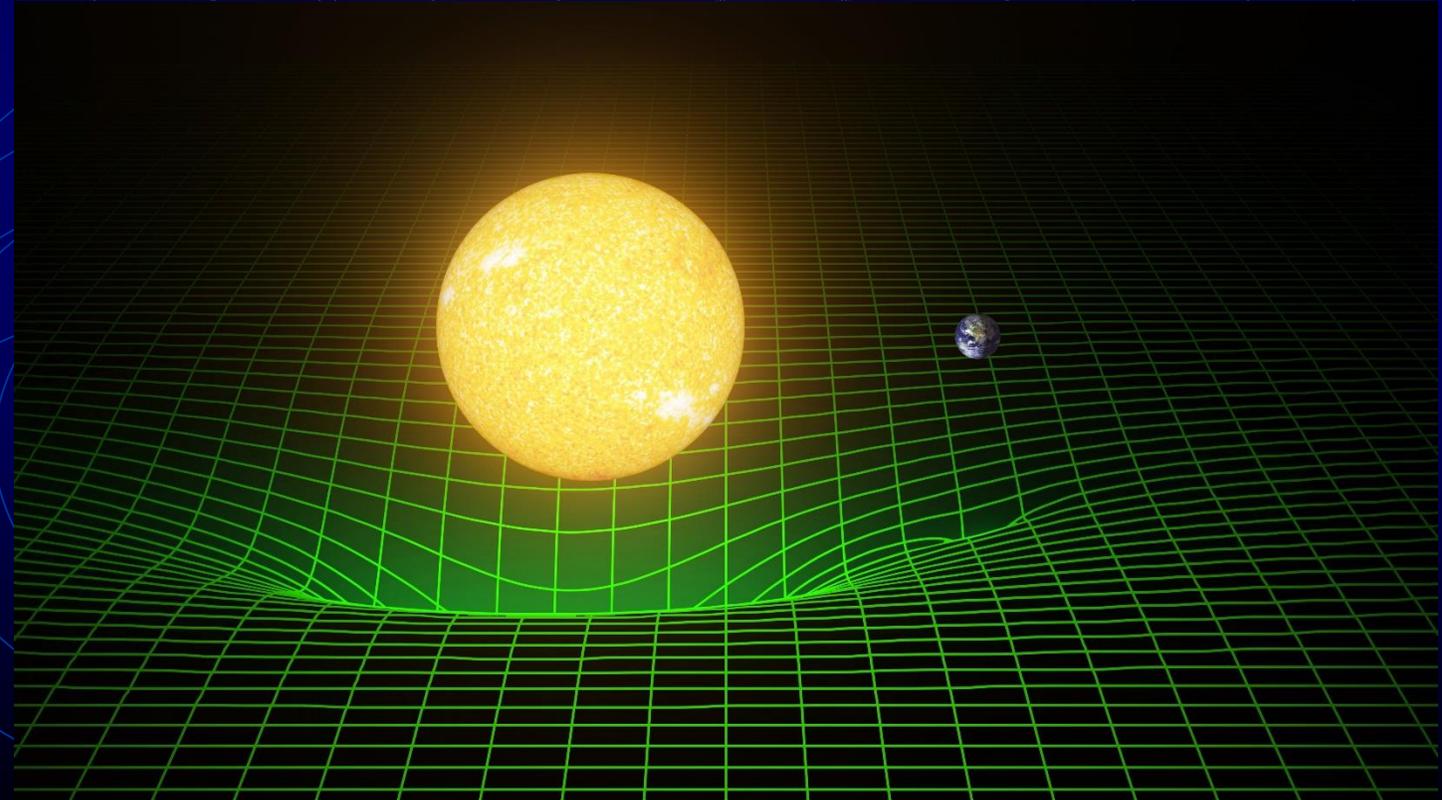


Rainer Weiss
Barry C. Barish
Kip S. Thorne

"for decisive contributions to the LIGO detector and the observation of gravitational waves"



質量決定空間如何彎曲
空間決定質量如何運動

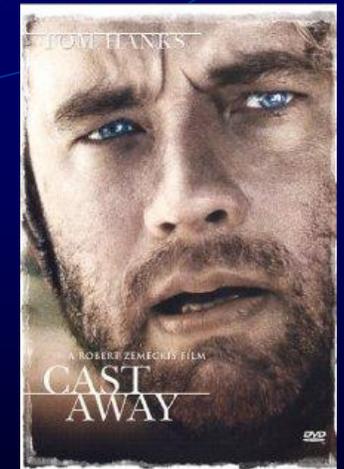
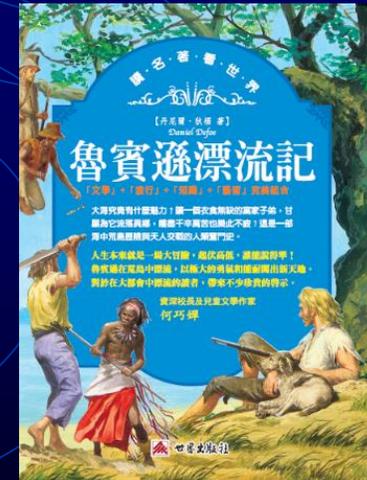


絕地救援 *The Martian* (2015)

2035年火星任務遇到沙塵暴，組員以為隊友
已經殉職而撤離

野外求生技能 + 「喂！我還活着」
+ 把他救回來

火星版「魯賓遜漂流記」 + 「浩劫重生」
物理、化學、生物、天文、航太



... to science the sh?t out of this



真的跟假的一樣

電影中的火星地景

假的跟真的一樣



好奇號拍攝的火星地景

火星為什麼這麼紅？



- A：表面覆蓋了氧化鐵，被風揚起到大氣當中
- Q：那為什麼火星（氧化）鐵特別多？

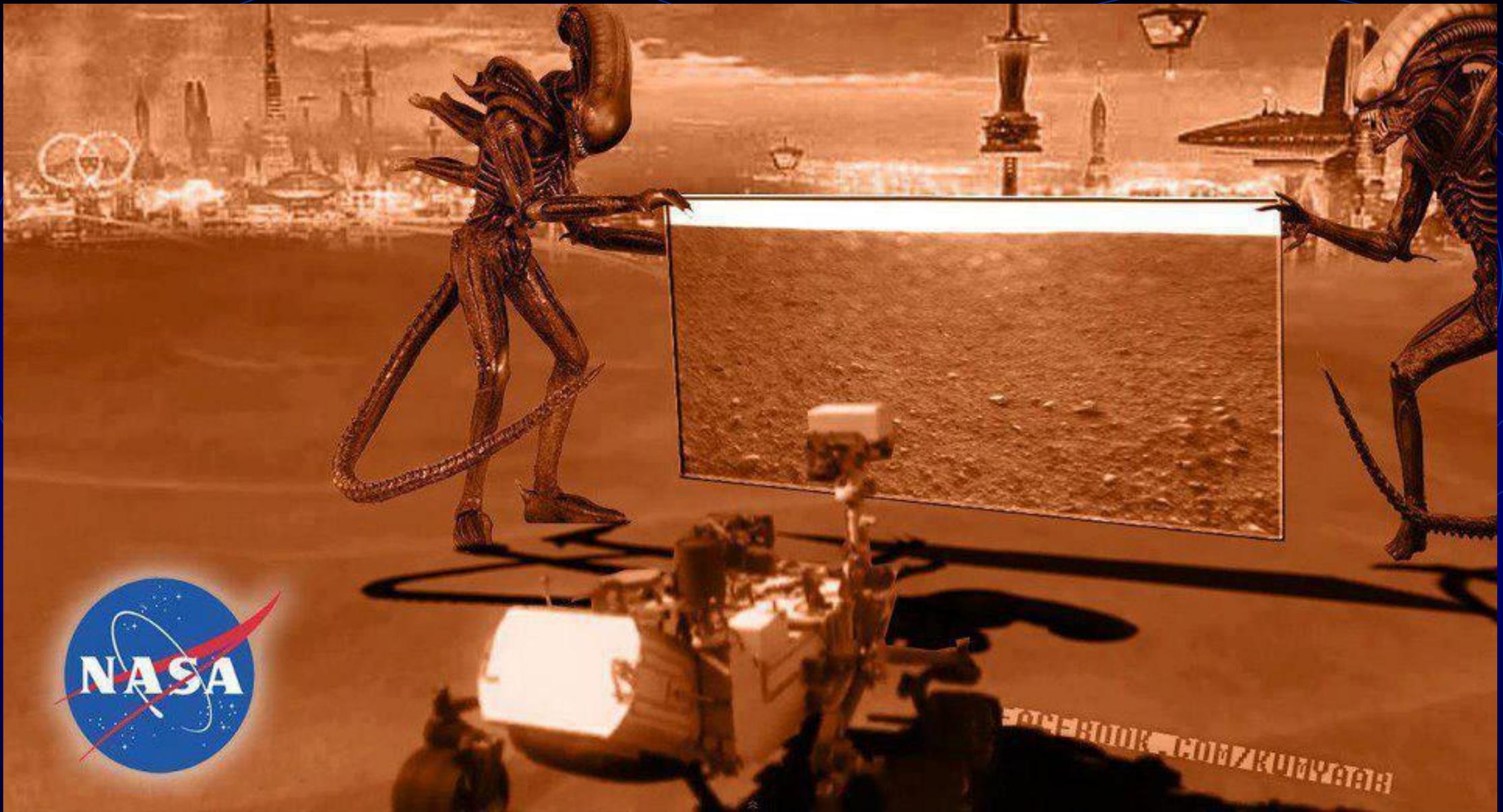
A1：不知道！

A2：早年火星有大量流水，也有火山活動。

水被陽光分解，氧化了火山噴發出的鐵

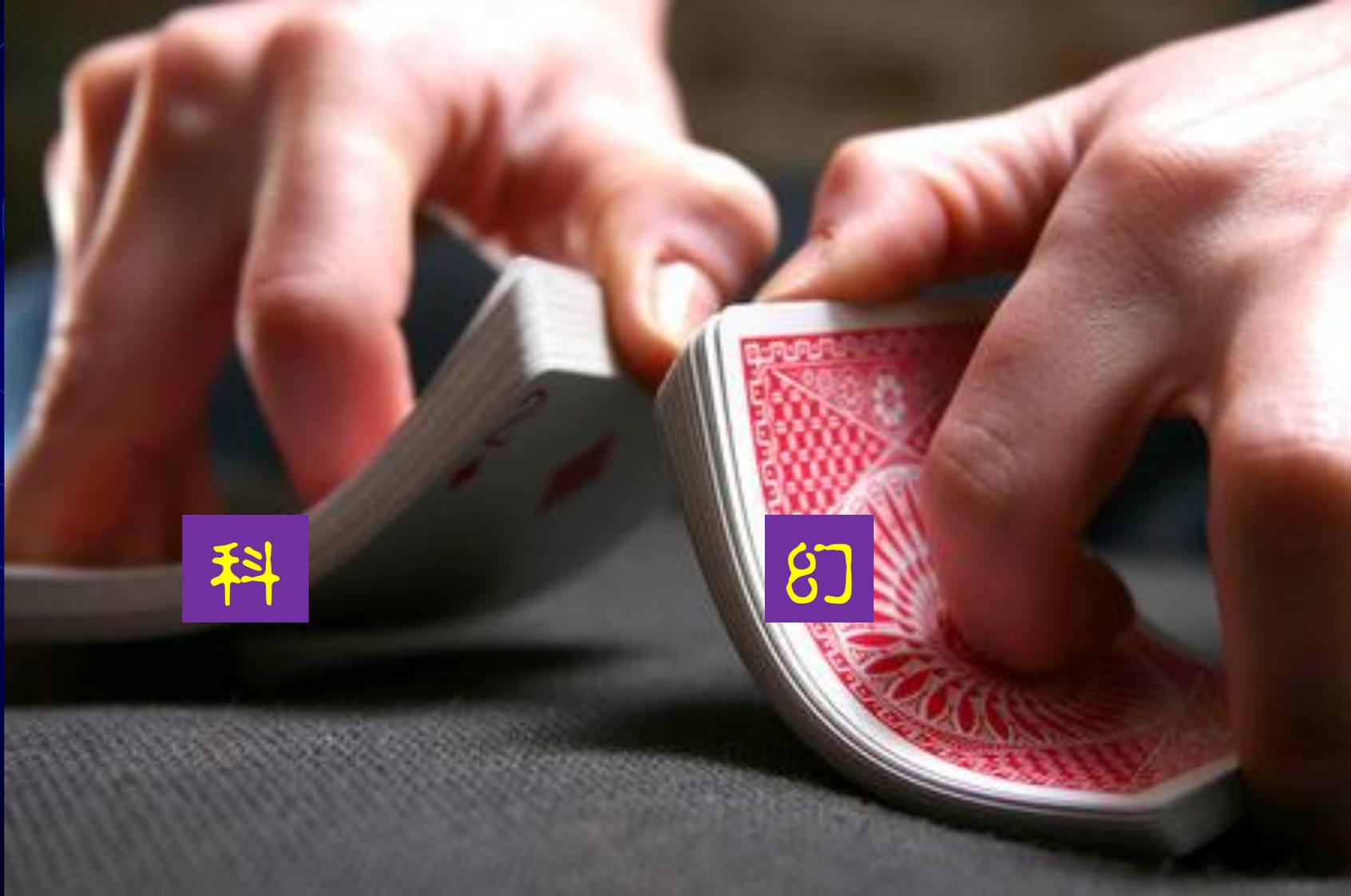
A3：鐵質隕石撞擊？





Funny TV commercial <http://www.youtube.com/watch?v=ZYzM1M1X790>

好看的科幻作品



科

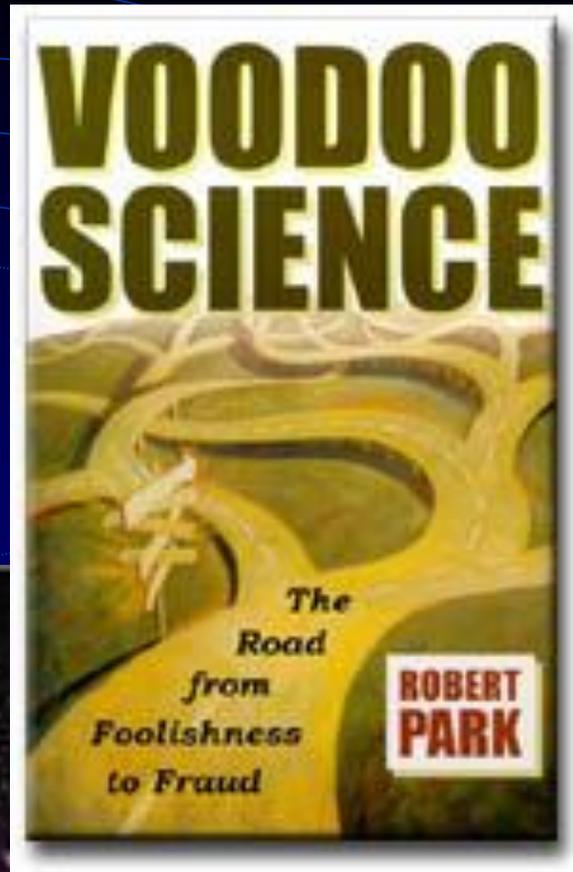
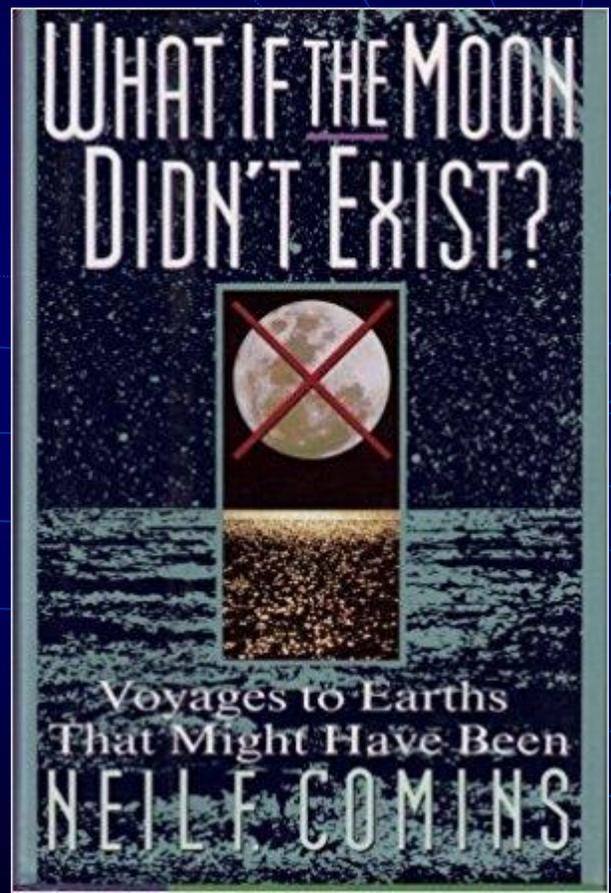
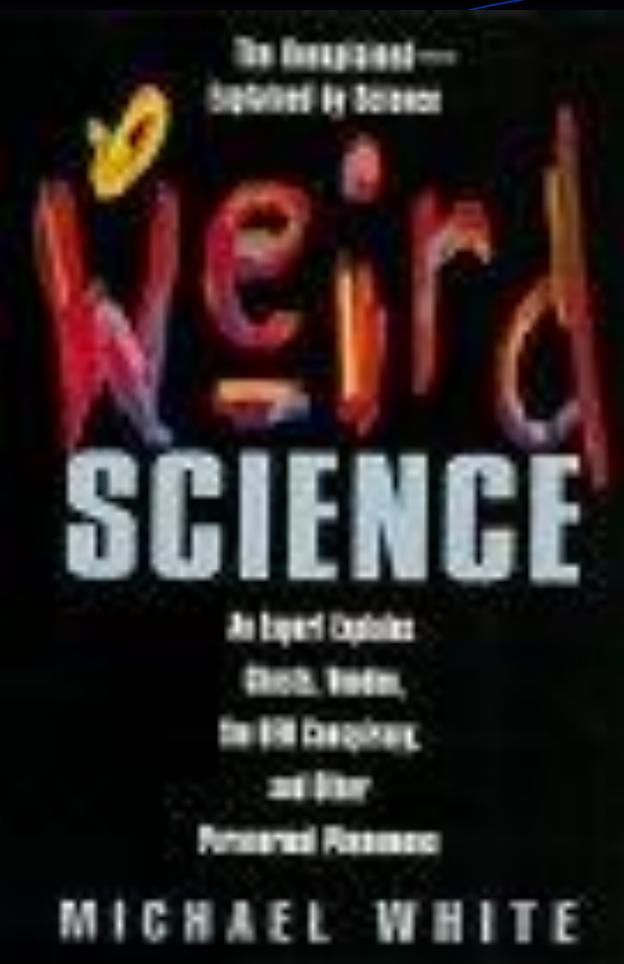
幻

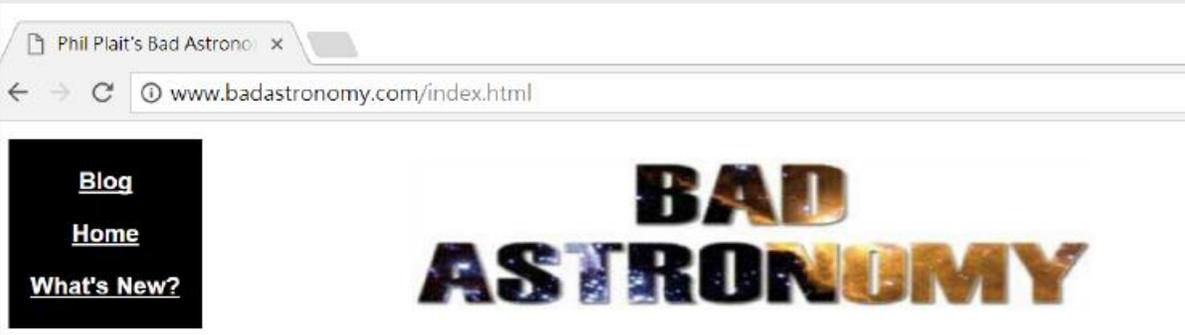
偽科學的把戲



事實

胡扯





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

- Bad Astronomy
 - Misconceptions
 - Movies
 - News
 - TV
- BA Blog
- Bulletin Board
- Media
 - Radio
 - In Print
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- Book Store
- Bad Astro Store
- Mad Science

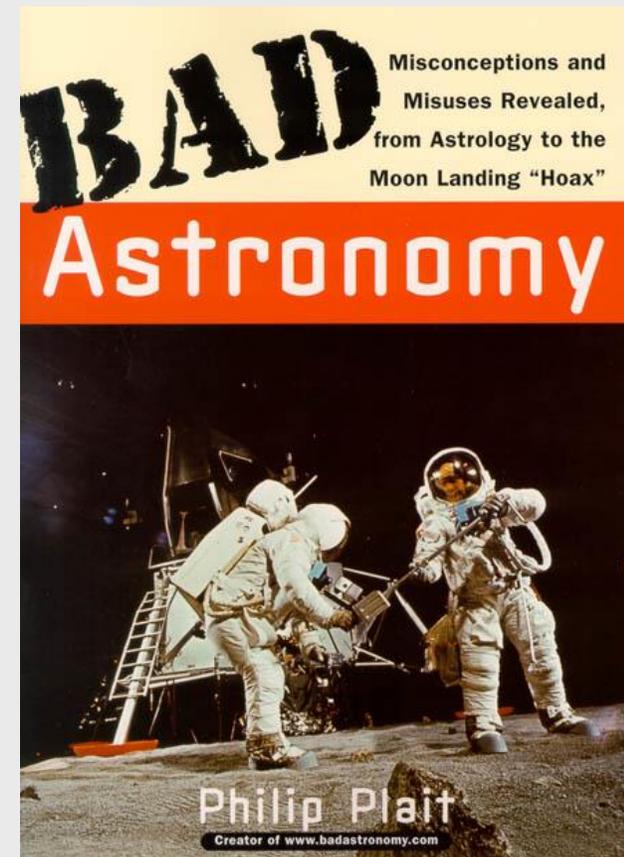
Welcome to the homepage for Bad Astronomy!

As an astronomer, teacher, lecturer and all-around science junkie, I am exposed to all sorts of people and their ideas about what goes on in the sky around them. I have been delighted to find that most people are very curious about the night (and day!) sky, but unfortunately a lot of misinformation is spread about astronomy. Sometimes this information is just plain silly, but many times it makes just enough sense that people believe it. Sometimes the news media help spread these ideas (like the one that you can [spin or stand an egg on end during the Vernal Equinox](#)), sometimes it's TV and sometimes it's plain old word of mouth, but the misinformation does get around.

I feel obliged to right these wrongs when I can. The Bad Astronomy web pages are devoted to airing out myths and misconceptions in astronomy and related topics. At the moment, I have no desire to tackle here such thorny topics as astrology, alternate views of the universe that are clearly in contradiction to observations, and the like. I *may* add something like that eventually, when I have more time (translation: "never").

But enough from me. Mark Twain said it best:

"In the space of one hundred and seventy-six years the Lower Mississippi has shortened itself two hundred and forty-two miles. Therefore ... in the Old Oolitic Silurian Period the Lower Mississippi River was upward of one million three hundred thousand miles long... seven hundred and forty-two years from now the Lower Mississippi will be only a mile and three-quarters long... There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact."

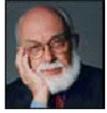


Search

Go!

SWIFT online

March 11, 2005



Yet Another Psychic Failure, A Praiseworthy Epiphany, Silly Stuff News, Hungarian Prize-Winner, More Psychic Hikers, Faith-Based Comparison, Not Enough Evidence, Watery Coffee From Starbucks, Pet Not-So-Psychic, More Fishy Science, A Goddess Is Attacked, John-Of-God Again, and In Conclusion...

Reader and contributor Claus Larsen in Denmark tells us: On March 3rd, the Danish National Radio had a half-hour show about police use of psychics. The background was a sad one: A 17-year old boy, Nicholas Povlsen from Svendborg had gone missing after a night of partying. The police strongly suspected that he had fallen in the nearby harbor, but couldn't locate the body. [Read More.](#)

[Read this week's Commentary](#) | [View the Commentary archive](#)

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[About James Randi](#)
A brief biography on James Randi.

[Randi's Calendar](#)
Important dates on Randi's lectures and other JREF activities.

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Educational and other useful links related to critical thinking. Scholarships and Awards information.

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Information and Graphics for the Media.

[Contact Information](#)
Email, address and phone numbers.

Million Dollar Challenge



One Million Dollars awaits the individual that can prove, in a controlled setting, that they have "super" powers. [Click here.](#)

TAM3: A Success



The Amazing Meeting 3 is over and it was a success! We will have a few updates here with articles and such.

- [Randi's Recap in his January 21 Commentary](#)
- [From Las Vegas Weekly](#)

Sylvia's Clock - Update



On September 3, 2001, Sylvia

1287

days

Browne agreed on the protocol for a definitive test for the JREF million-dollar challenge, on Larry King Live. This shows the number of days that have passed since her acceptance. It has been 1103 days since she first agreed to take the test!

[Sylvia's updated response](#) | [Read more](#)

DVD from TAM2



Here is the complete DVD set from the second Amazing Meeting! [Click here to order.](#)

JREF Store



As part of our fund raising efforts, the JREF is offering certain products related to our efforts. [Click here.](#)

JREF Forum



Be part of the JREF web community by engaging in intelligent discussions with both skeptics and non-skeptics from around the

Challenge Info

VwXwZf

Written by JREF Staff

One Million Dollar Paranormal Challenge

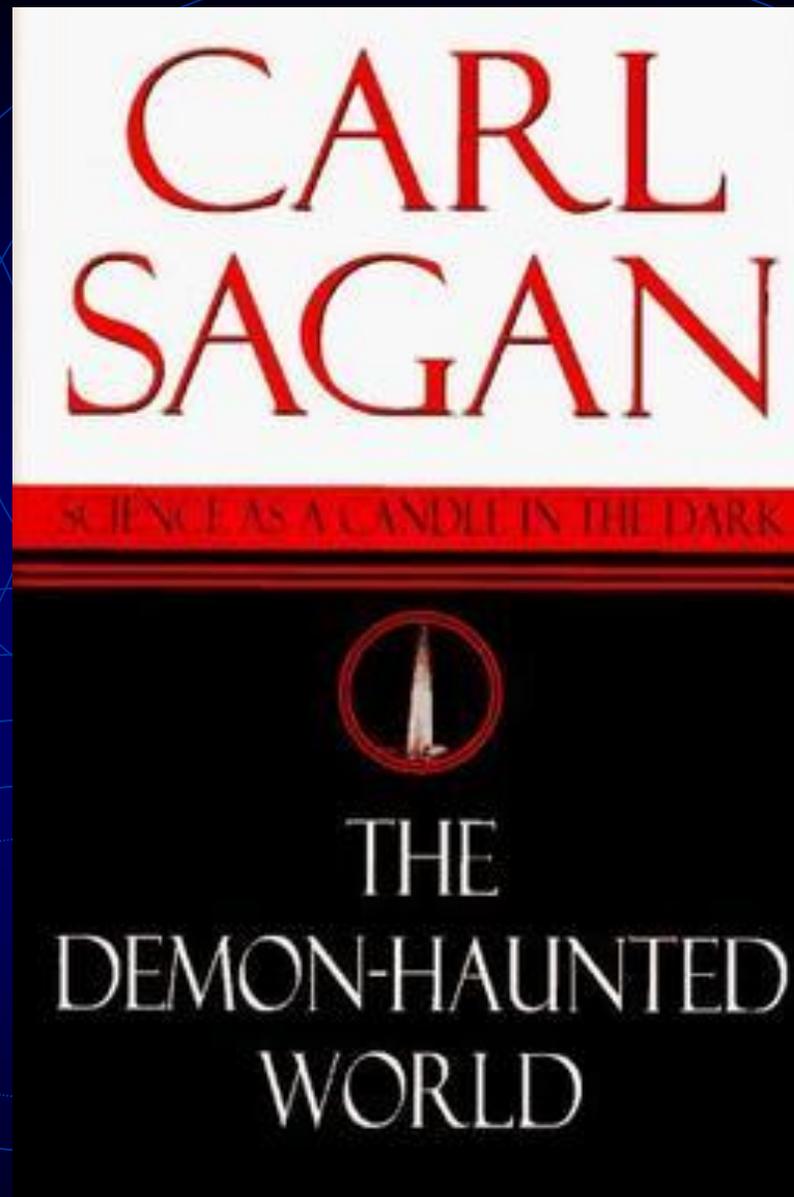
The Foundation is committed to providing reliable information about paranormal claims. It both supports and conducts original research into such claims.

At JREF, we offer a one-million-dollar prize to anyone who can show, under proper observing conditions, evidence of any paranormal, supernatural, or occult power or event. The JREF does not involve itself in the testing procedure, other than helping to design the protocol and approving the conditions under which a test will take place. All tests are designed with the participation and approval of the applicant. In most cases, the applicant will be asked to perform a relatively simple preliminary test of the claim, which if successful, will be followed by the formal test. Preliminary tests are usually conducted by associates of the JREF at the site where the applicant lives. Upon success in the preliminary testing process, the "applicant" becomes a "claimant."

To date, no one has passed the preliminary tests

誰能在「足供檢視」的環境下證明「超」能力，便能獲得一百萬美金。

<http://www.randi.org/>



「偽科學」的七項特徵

By Robert Clark <http://chronicle.com/free/v49/i21/21b02001.htm>

1. 「發現者」直接將成果訴諸媒體 (冷核融合)
2. 發現者宣稱受到打壓 (以水當燃料的引擎)
3. 證據總在偵測極限 (尼斯水怪照片從來不清楚)
4. 證據來自密聞 (雙盲實驗很重要)
5. 某現象已經流傳千百年了 (馬雅人真厲害)
6. 發現者孤立獨行
7. 必須創立新的自然法則來解釋



結論

- 看電影的目的不是學科學，而是看科學學得好不好
- 好看的科幻電影得有部分科學真實，又有很多幻想
- 多樣的大自然給我們出的考題，以及科學家找答案的過程，精彩程度有如電影或小說
- 這年頭連江湖郎中都得多讀書、多思考
- 訓練自己理性思考的習慣