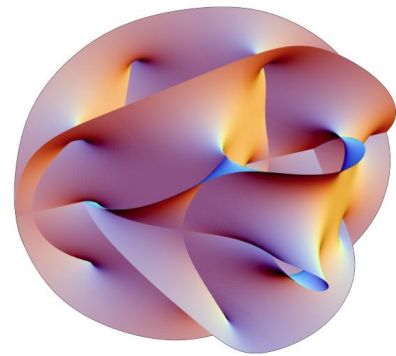


Why Does Our Universe Have Three Dimensions?

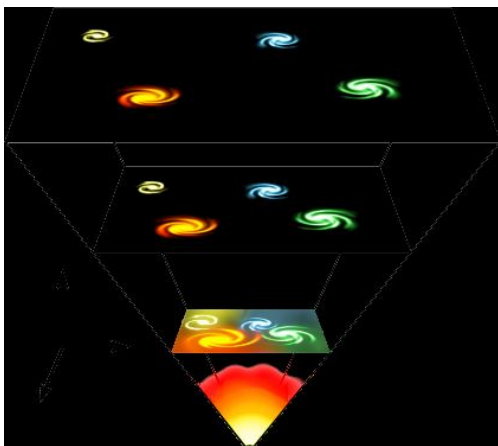
Why does our universe look the way it does? In particular, why do we only experience three spatial dimensions in our universe, when superstring theory (* ①超弦理論*), for instance, claims that there are **ten** dimensions -- nine spatial dimensions and a tenth dimension of time?

Japanese scientists think they may have an explanation for how a three-dimensional universe emerged (浮現) from the original nine dimensions of space. They describe their new supercomputer calculations simulating the birth of our universe in a forthcoming paper in *Physical Review Letters*.



Pulling Strings

According to string theorists, there are the three full-sized spatial dimensions we experience every day, one dimension of time, and six extra dimensions crumpled up (倒塌) at the Planck scale (* ②普朗克尺度*) like itty-bitty (極小的) wads of paper. As tiny as these dimensions are, strings -- the most fundamental (基本的) unit in nature, vibrating down at the Planck scale -- are even smaller.



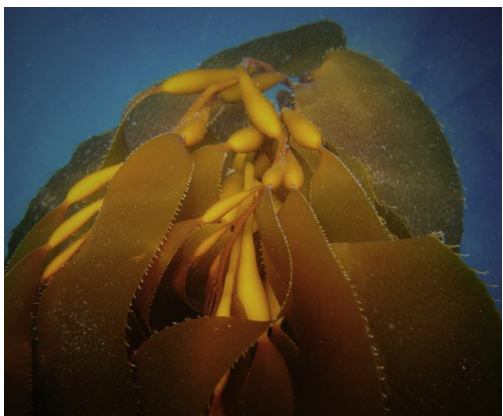
The geometric shape of those extra dimensions helps determine the resonant (共鳴的) patterns of string vibration. Those vibrating patterns in turn determine the kind of elementary particles that are formed, and generate the physical forces we observe around us, in much the same way that vibrating fields of electricity and magnetism give rise (引起) to the entire spectrum (光譜) of light, or vibrating strings can produce different musical notes on a violin.

All matter (and all forces) are composed of these vibrations -- including gravity. And one of the ways in which strings can vibrate corresponds to a particle that mediates gravity.

Voila! (瞧) General relativity has now been quantized (量子化). And that means string theory could be used to explore the infinitely tiny point of our universe's birth (or, for that matter, the singularity (獨一) that lies at the center of a black hole).

Seaweed Biofuel Breakthrough Found!

Transforming seaweed into fuel has been the dream of many a scientist, entrepreneur (企業家), and policy maker for years, particularly as debates have escalated (逐漸上升) over traditional biofuel (*③生物燃料*) crops—namely corn and sugar cane. Those biofuel sources compete with food crops for precious arable land and fresh water. Seaweed doesn't.



The great stumbling block (絆腳石) for seaweed has been that standard microbes cannot readily metabolize its primary sugar constituent, known as alginate (*④褐藻酸鹽*). Two other sugars found in seaweed ferment (酵母) readily, but without conversion (轉變) of the alginate, biofuel production from seaweed is simply too inefficient, and thus too expensive, to ever compete seriously with petroleum-based fuels.

IMAGE: *Brown seaweed holds sugars that can be converted into renewable fuels and chemicals. (Photo courtesy of Bio Architecture Lab)*

Now, using synthetic biology (合成生物學) and enzyme engineering (酵素工程學), Adam Wargacki of Bio Architecture Lab in Berkeley, Calif., and his colleagues have made seaweed more palatable. The team has engineered a new form of *E. coli* (Escherichia coli, 大腸桿菌) bacteria that can digest *all* the sugars found in brown seaweed, including alginate.

Their fermentation experiments using the new microbe, has reported recently in the journal *Science*, successfully achieved 80% of seaweed's maximum theoretical ethanol yield, which is double that of sugar cane and five times that of corn. Whether the good work of this newly engineered microbe can be scaled up economically is the next question.

Meanwhile, it is worth reviewing other ideas for sustainable biofuel production. For instance, the same method that is used to decaffeinate (除去咖啡因) coffee and to extract hops to make beer can turn wood into biofuel:

Some research shows that making biofuel from grasses and other hearty plants that can grow on land unsuitable for growing food crops could satisfy half of our liquid fuel needs.

超弦理論: 在這個理論中，電子、質子、夸克等等粒子都是由弦構成的，意思是說，構成物質的基本單元是「弦」。不存在很多種弦，只有一類弦。一類弦可以完成不同模式的運動，就像樂器中一根弦可以奏出不同的聲音那樣，形成了各種不同的物質。

普朗克尺度: $l = gh/c^3 \sim 10^{-35}m = 10E^{-33}$ 厘米。普朗克常數記為 h ，是一個物理常數，用以描述量子大小。

生物燃料: 泛指由生物質組成或萃取固體、液體或氣體。所謂的生物質係指有機活體或者有機活體新陳代謝的產物，例如牛糞。不同於石油、煤炭、核能等傳統燃料，這新興的燃料是可再生能源。

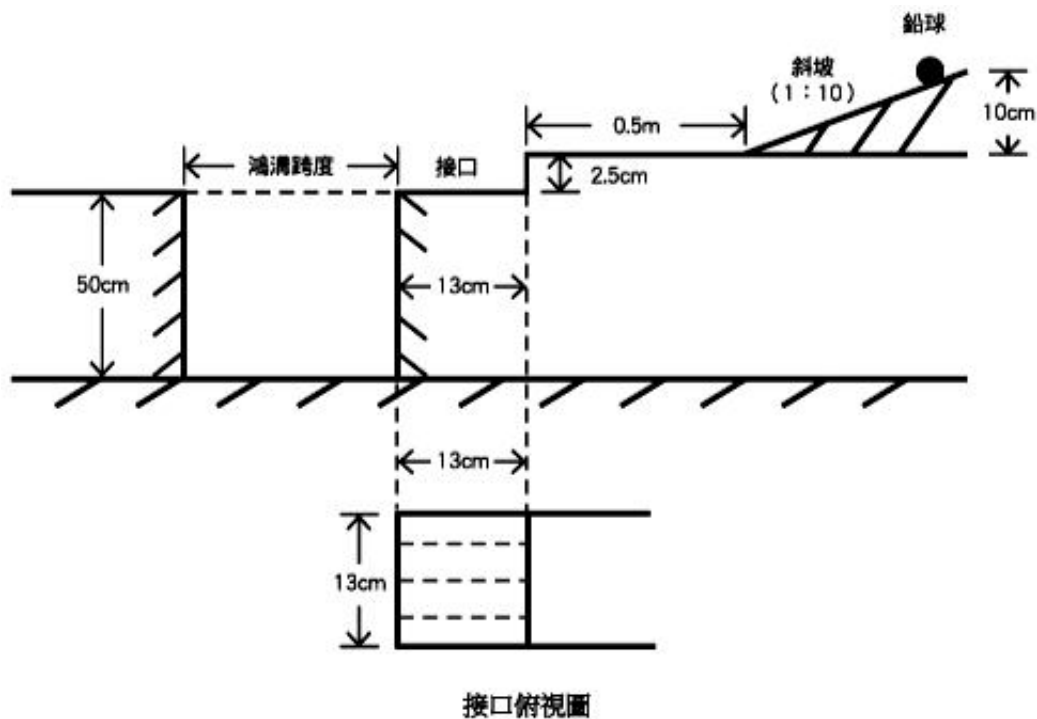
褐藻酸鹽: 是天然物質，蘊藏於棕色海藻(Phaeophyceae)。乾透了的棕色海藻，其中褐藻酸鹽的重量可佔 40%之多。褐藻酸鹽位於棕色海藻的細胞壁裏，以不同型式，如鈣，鎂和鈉離子等跟海藻酸組成鹽類。

2011-12 年度科學比賽---深谷還珠

日期：3月16日(星期五) 時間：全校週會 地點：本校禮堂

比賽規則

1. 器件用料依下列組別規定，惟不能直接採用坊間商品。
2. 器件須置於鴻溝跨度上，除接口位置外，器件不能觸碰其他部分（包括地面）。
3. 測試：用包膠的鉛球（直徑約 11.8cm，重 3 千克）將置於一斜坡（1：10）離枱面 10cm（垂直距離）的位置上。鉛球從靜止狀態沿斜坡滾下，經過器件，橫渡鴻溝。成功讓鉛球滾過的設計，以較輕者為優勝。
4. 目標：跨越鴻溝(跨度為 1m)。若跨度成績相同，則以器件較輕者為優勝。
5. 比賽分初中組（中一至中三）和高中組（中四至中五）進行。
初中組：材料不限，但設計器件的總重量不得超過 500 克。
高中組：限用報紙（光面粉紙除外），繩和線，總重量不得超過 2000 克。
（註：科學學會將於賽後或需剪開器件檢查用料是否合乎規格。）
6. 比賽詳情及報名方法請參閱張貼於科學學會壁報板（設於一樓，近 102 室的梯口）的簡介。
7. 科學學會將保留最終決定權。



有關比賽設施及鴻溝跨度尺度 (不按比例)

SCIENCE SOCIETY 2011-12

CHAIRPERSON: MAK SHUN KI 麥順淇 4E

COMMITTEE MEMBER:

LAU WAI NIM 劉威念 4A, LEE KA HANG 李嘉恒 4A, TANG PUI KEI 鄧珮琦 4A,

LAM HO LIM 林皓廉 4D, WONG CHUN FUNG 黃進鋒 4D, CHAU IRIS 周雅詩 4E &

CHIK CHUNG YIN 植頌然 4E

2011 年十大科學新聞選舉結果

詳細新聞內容，請參閱科學學會之壁報板。

第一位： “第二地球”現身	第二位： 超光速粒子挑戰愛因斯坦相對論
第三位： “蘋果”創始人喬布斯去世	第四位： 日本大地震引發核危機
第五位： 世界人口超過 70 億	第六位： 地球歷史上最大一次生物滅絕原因揭曉—有毒煙霧雲
第七位： 人類祖先在 320 萬年前就已靠雙腳行走	第八位： 距今 135 億年的最古老星系現身
第九位： 火星上的流動水證據首次被發現	第十位： “太空中存在氧分子”首次得到確認

感謝同學的參與!!!!

※今期數獨及科學測驗的活動暫停，上一期答案將於下月的理聲公佈，不便之處，敬請原諒。

科普講座名稱	日期	時間	地點	講員
醫療科技之中風機械手	2 月 4 日 (六)	9:30 - 10:00am	新一代科學創意中心	香港理工大學醫療及資訊科技學系 湯啟宇博士
香港的輻射監測	2 月 4 日 (六)	2:30 - 3:30pm	香港科學館演講廳	李淑明女士(香港天文台高級科學主任)
「水到渠成」	2 月 18 日 (六)	2:30 - 4:00pm	香港科學館演講廳	馬利德工程師(水務署署長)及陳志超工程師(渠務署署長)
「鋪橋搭路」	2 月 25 日 (六)	2:30 - 4:00pm	香港科學館演講廳	劉家強工程師(路政署署長)

Lunch Time Video Show: Feb 2011 地球歷險記 (12:20p.m.) @ Chem Lab Rm512

Date	Name of Program	Area
10/2 (Fri)	Killers of Costa Rica 哥斯大黎加殺人鍾 (Part I)	Adventure 探險
17/2 (Fri)	Killers of Costa Rica 哥斯大黎加殺人鍾 (Part II)	Adventure 探險
24/2 (Fri)	Expedition Antarctica 南極大遠征 (Part I)	Adventure 探險

賀!!! 本校姚俊賢(6C)、陳資瀚(6D)、鍾禮謙(6D)、顧嘉煒(6D)、麥駿穎(6D)及楊雋邦(6D)同學贏得由香港教育城主辦的「國際化學年 2011」(香港)網上短片比賽中學組冠軍。他們的作品名為「心繫化學」。有興趣觀賞的人士可到下列網址瀏覽。

<http://forum.hkedcity.net/viewthread.php?tid=116865&extra=page%3D1&fid=127>