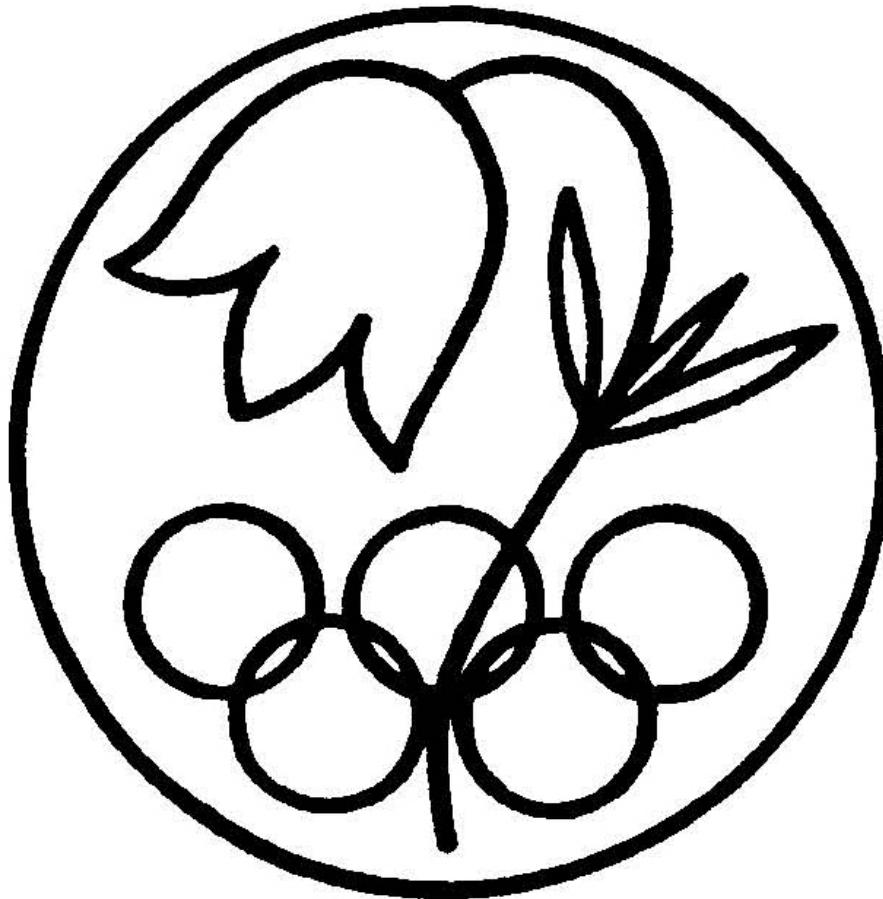


INTERNATIONAL BIOLOGY OLYMPIAD



國際生物奧林匹亞競試培訓

IBO 緣起回顧



1985~1989 捷克、波蘭兩國生物競賽

UNESCO 委託 Czechoslovakia 主辦

1989 正式成立 IBO

(Prague and Brno)



Year	Country	(City)	Number of participating countries
1990	Czech Republic	(Olomouc)	6
1991	Russia	(Machatskala)	9
1992	Slovak Republic	(Poprad)	12
1993	The Netherlands	(Utrecht)	15
1994	Bulgaria	(Varna)	18
1995	Thailand	(Bangkok)	22
1996	Ukraine	(Artek)	23
1997	Turkmenistan	(Ashgabat)	28
1998	Germany	(Kiel)	33
1999	Sweden	(Uppsala)	36
2000	Turkey	(Antalya)	38
2001	Belgium	(Brussels)	38
2002	Latvia	(Riga)	40
2003	Belarus	(Minsk)	41
2004	Australia	(Brisbane)	40
2005	China	(Beijing)	50

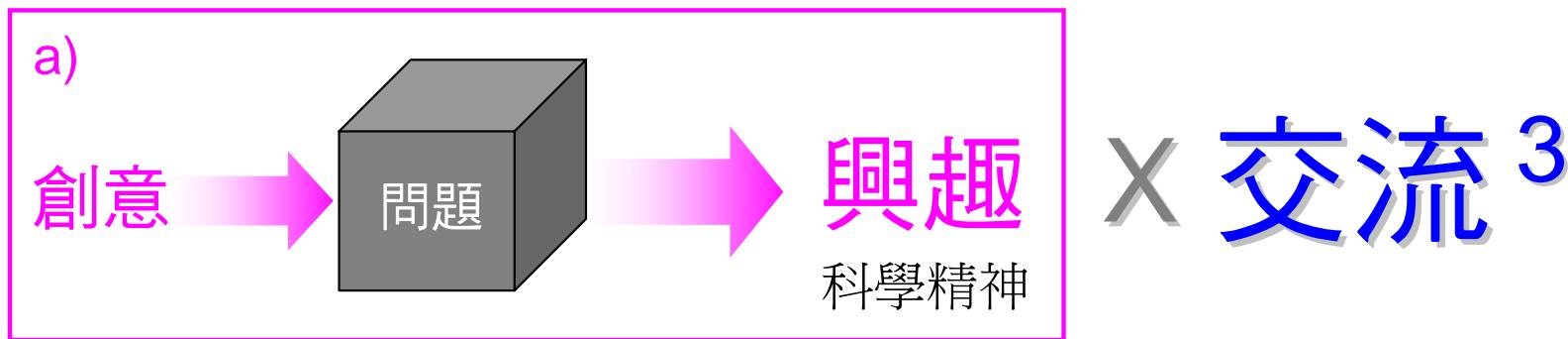
← 台灣加入



國際生奧精神

The International Biological Olympiad (IBO) is a competition for secondary school students who are interested in biology. The sole purpose of this competition is:

- a) to stimulate active interest in biological studies by the **creative solution** of biological problems,
 - b) to promote exchange of ideas and materials about biology education,
 - c) to promote regular international contacts between biology students,
 - d) to establish friendly relations among young people from different countries and thus to stimulate cooperation and understanding between nations.
-
- a) 藉由有創意地解決生物問題，刺激青年對生物學學習的高度興趣。
 - b) 促進生物教育理念與教材的交流。
 - c) 促進生物領域間的一般性國際交流。
 - d) 建立來自不同國家青年之間的友誼，從而提供合作關係及國與國之間的相互瞭解。



中國 2005



比利時 2001



捷克 1990



比利時 2001



Source: IBO web site (<http://www.ibo-info.org/>)

澳洲 2004



烏克蘭 1996



中國 2005



比利時 2001



比利時 2001



中國 2005



烏克蘭 1996



榮譽與友誼



IBO 未來十年主辦國



17	2006	Argentina	Rio Cuarto	9-16 July	www.ibo2006.org.ar
18	2007	Canada	Saskatoon	15-22 July	
19	2008	India			(preliminary application)
20	2009	Korea			(preliminary application)
21	2010	Kazakhstan			(preliminary application)
22	2011	Chinese Taipei			(preliminary application)
23	2012	Cyprus			(preliminary application)
24	2013	Finland			(preliminary application)
25	2014	Iran			(preliminary application)

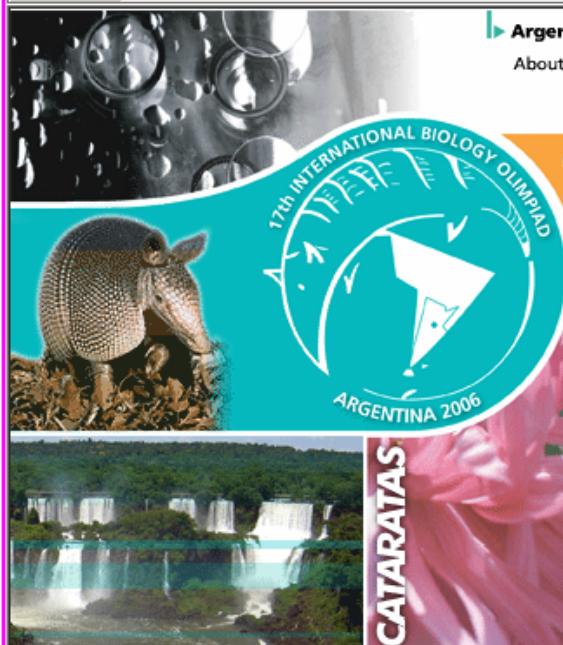


IBO 2006 - Argentine - Microsoft Internet Explorer

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網址(D) http://www.ibo2006.org.ar/ingles/index.php



CATARATAS

SALTA

JUJUY

NEUQUEN

GLACIAR

[Argentine Information](#) [History](#) [Team Registration](#) [Rules](#) [General Info](#)

About Rio Cuarto

From July 9 to 16, 2006
Río Cuarto - Córdoba
Argentina

UNIVERSIDAD NACIONAL
DE RIO CUARTO
HOME OF IBO 2006



The International Biology Olympiad (IBO) is a competition for secondary school students. Their skills in tackling biological problems, and dealing with biological experiments are tested. Interest in biology, inventiveness, creativity and perseverance are necessary.

Every participating country sends four students, who are the winners of the respective national competitions. They are to be accompanied by two team leaders as representatives of each country. In bringing together gifted students, the IBO tries to challenge and stimulate these students to expand their talents and to promote their career as a scientist, so biology talents do not get lost. The Olympiad also is focussing on biology as a beautiful and valuable subject. Many biological topics like ethology and ecology stress the importance of biology for society, especially items such as nature preservation and/or environmental protection.

The olympiad offers the opportunity to compare the syllabuses and educational trends in biology in different countries. This is useful information to improve biology education on a national level.

Many institutions are involved in the organization of the national olympiad: ministry of education, industry, teachers' associations, universities, schools.

Contacts between these institutions will lead to a better understanding and communication about their respective activities in the field of biology.

Argentina will be the country which organize the IBO in 2006. We expect a good competition and to share the same spirit.

**NEWS**

- [Information](#)
- [Event Program](#)
- [FAQ'S](#)



2006
阿根廷



精緻規劃
發揮特色
公平大方

Armadillo 犀狳



IBO 試題範圍 (Theoretical part)

Content Theoretical part of the IBO

- (1) Concentrate on biological concepts applied to the majority of organisms
- (2) The majority of questions should test students' understanding, science process skills and application of their biological knowledge.
- (3) The questions testing only knowledge should be as few as possible
- (4) Questions concerning Principles of Scientific Reasoning and Principles of Biological Methods should be included in the Theoretical test.

I Cell biology : (20%)

Structure and function of cells

- *Chemical components
 - monosaccharides; disaccharides; polysaccharides
 - lipids
 - proteins: amino acids, three letter symbol; structure
 - + chemical classification of proteins
 - + functional classification of proteins: structural proteins and enzymes
 - enzymes
 - + chemical structure: apoenzyme and coenzyme
 - + model for enzyme action: enzyme binds with substrate
 - + denaturation + nomenclature
 - nucleic acids: DNA, RNA
 - other important compounds
 - + ADP and ATP, NAD⁺ and NADH, NADP⁺ and NADPH

*Organelles

Nucleus

- nuclear envelope - (nucleohyaloplasm) - chromosomes - nucleoli

Cytoplasm

- cell membrane - hyaloplasm - mitochondria - endoplasmatic reticulum
- ribosomes - Golgi apparatus - lysosomes - vacuole membrane
- proplastides - plastides
 - + chloroplasts, chromoplasts, leucoplasts (e.g. amyloplasts)

Plant cells are surrounded with a cell wall

*Cell metabolism

- breakdown of carbohydrates
 - + anaerobic break down (anaerobic respiration) of glucose: glycolysis
 - + aerobic break down (aerobic respiration) of glucose: glycolysis

Citric acid cycle

Oxidative phosphorylation

- dissimilation of fats and proteins -assimilation
 - + photosynthesis + light reaction + dark reaction (Calvin cycle)

*Protein synthesis

- transcription - translation - genetic code

*Transport through membranes

- diffusion - osmosis, plasmolysis - active transport

*Mitosis and meiosis

- cell cycle: interphase (replication) and mitosis (prophase - metaphase - anaphase - telophase)
- chromatids, equatorial plate, haploid and diploid, genome, somatic and generative cells, gamete, crossing over
- meiosis I and meiosis II

Microbiology

*Prokaryotic cell organization

*Morphology

*Phototrophy and chemotrophy

Biotechnology

*Fermentation

*Genetic manipulation of organisms

II Plant anatomy and physiology (15%)

Structure and function of tissues and organs involved in:

- *Photosynthesis, transpiration and gas exchange
 - leaf : structure; function stomata

*Transport of water, minerals and assimilates

- root: structure (endodermis)
- stem: structure (vascular bundles)

*Growth and development

- apical meristem and cambium - germination

*Reproduction (ferns and mosses included)

- asexual reproduction (clone forming)

- sexual reproduction

- + structure of flowers + pollination + double fertilization

- alternation of generation in seed plants, ferns and mosses

IBO 試題範圍 (Theoretical part)

III Animal anatomy and physiology (25%)

Structure and function of organs and tissues involved in

- *Digestion and nutrition
 - digestive tract (including liver, gall bladder and pancreas)
 - mechanical and chemical breakdown of food
 - absorption - food components
(water, minerals, vitamins, proteins, carbohydrates and fats)
- *Respiration
 - breathing mechanism - gas exchange - respiratory organs
- *Circulation
 - blood: blood plasma, red blood cells, white blood cells, blood platelets
 - blood circulation: arteries, capillaries, veins, heart
 - lymphatic system: tissue fluid, lymph
- *Excretion
 - structure of the renal system - urine production
- *Regulation (neural and hormonal)
 - nervous system - endocrine system
- *Reproduction and development
 - structure and function of male and female reproductive systems
 - ovulation and menstrual cycle - fertilization
 - formation of ectoderm, mesoderm, endoderm
 - embryonic membranes
- *Immunity - antigens, antibodies

IV Ethology (5%)

- * Methodology of ethology
- * Innate and learned behavior
- * Communication and social organization
- * Foraging behavior
- * Defensive behavior
- * Mating systems and parental care
- * Biorhythms

V Genetics and Evolution (20%)

- *Variation: mutation and modification
- *Mendelian inheritance
 - monohybrid cross - dihybrid cross - polyhybrid cross
- *Multiple allelism, recombination, sex linkage
- *Hardy-Weinberg principle
- *Mechanism of evolution
 - mutation - natural selection - reproductive isolation - adaptation - fitness

VI Ecology (10%)

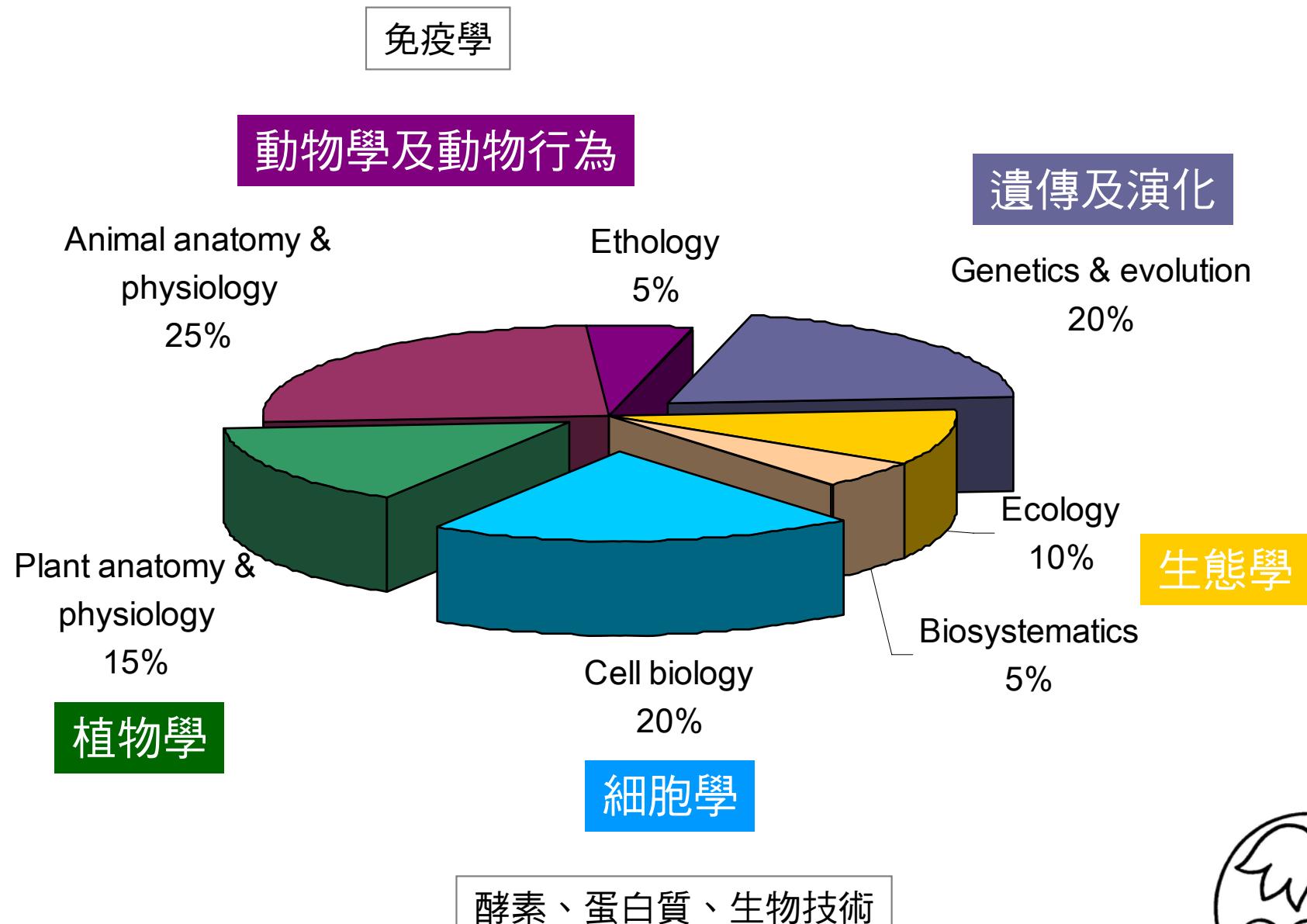
- *Individual Organisms
 - unitary and modular organisms
- *Population
 - population structure + dispersion, age, size and sex structure
 - population dynamics
 - + birth rate, death rate
 - + exponential and logistic growth, carrying capacity
 - population regulation + metapopulation dynamics
- *Biotic communities
 - species richness and diversity
 - niche, competition exclusion principle
 - interspecific interactions + competition, predation, symbiosis
 - community dynamics + succession
 - terrestrial biomes
 - aquatic biomes
- *Ecosystems
 - trophic structure + food webs
 - trophic levels + producers, consumers, decomposers
 - energy flow
 - productivity
 - matter flux through ecosystems
 - global biogeochemical cycles
- *Biosphere and man
 - human population growth
 - pollution
 - + threats of biodiversity
 - + in situ conservation
 - + ex situ conservation

VII Biosystematics (5%)

Structure and function, evolutionary and ecological relationships among typical organisms in the following groups. Knowledge of scientific terms will not be required for successful solution of the tasks. However, competitors should know what the named representatives of genera mentioned below look like.

Domain Archaea, Domain Bacteria, Domain Eukarya
Kingdom Protista, Kingdom Fungi, Kingdom Animalia

IBO 試題範圍 (Theoretical part)



IBO 試題範圍 (Practice part)

Basic Skills for the Practical Part of the IBO

The IBO practical examination should concentrate on the evaluation of competitors for their ability to solve given biological problems using the following skills.

I Science Process skills

- 1 Observation
- 2 Measurement
- 3 Grouping or classification
- 4 Relationship finding
- 5 Calculation
- 6 Data organization and presentation: graphs, tables, charts, diagrams, photographs
- 7 Prediction / projection
- 8 Hypothesis formulation
- 9 Operational definition: scope, condition, assumption
- 10 Variable identification and control
- 11 Experimentation: experimental design, experimenting, result/data recording, result interpretation and drawing conclusions.
- 12 Representing numerical results with appropriate accuracy

II Basic biological skills

- 1 Observation of biological objects using magnifying glasses
- 2 Work with a microscope (objective max. 45 x)
- 3 Work with a stereomicroscope
- 4 Drawing of preparations (from a microscope, etc.)
- 5 Exact description of a biological drawing using tables of biological terms marked with a numerical code

III Biological methods

Competitors in the IBO should know the following methods and be able to use them.

A Cytological methods

- 1 Maceration and squash technique
- 2 Smear method
- 3 Staining of cells and slide preparation

B Methods to study plant anatomy and physiology

- 1 Dissection of plant flower and deduction of flower formula
- 2 Dissection of other plant parts: roots, stems, leaves, fruits
- 3 Free - hand sectioning of stems, leaves, roots
- 4 Staining (for example lignin) and slide preparation of plant tissues
- 5 Elementary measurement of photosynthesis
- 6 Measurement of transpiration

C Methods to study animal anatomy and physiology

- 1 Dissection of arthropods and annelids
- 2 Whole - mount slide preparation of small invertebrates
- 3 Elementary measurement of respiration

D Ethological methods

- 1 Determination and interpretation of animal behavior

E Ecological and environmental methods

- 1 Estimation of population density
- 2 Estimation of biomass
- 3 Elementary estimation of water quality
- 4 Elementary estimation of air quality

F Taxonomic methods

- 1 Use of dichotomous keys
- 2 Construction of simple dichotomous keys
- 3 Identification of the most common flowering-plant families
- 4 Identification of insect orders
- 5 Identification of phyla and classes of other organisms

IV Physical and chemical methods

- 1 Separation techniques: chromatography, filtration, centrifugation
- 2 Standard tests for monosaccharides, polysaccharides, lipids, protein (Fehling, I₂ in KI (aq), biuret)
- 3 Titration
- 4 Measuring quantities by drip and strip methods
- 5 Dilution methods
- 6 Pipetting, including use of micropipettes
- 7 Microscopy, including use of counting chambers
- 8 Determination of absorption of light
- 9 Gel electrophoresis

V Microbiological Methods

- 1 Preparing nutrient media
- 2 Aseptic techniques (flaming and heating glass material)
- 3 Inoculation techniques

VI Statistical methods

- 1 Probability and probability distributions
- 2 Application of mean, median, percentage, variance, standard deviation, standard error, T test, chi-square test

VII Handling equipment

Due to differences in the equipment between participating countries, these skills can only be evaluated if the competitors have been informed beforehand about the algorithm, how to use the equipment, how to proceed with a particular experiment, ...etc.

生奧台灣隊歷年成績



Taiwan



號數為當次競試四位參賽者之名次

加總分數

屆	年	Gold	Silver	Bronze	
10	1999	5, 6, 9	21		41
11	2000	3, 5, 6	25		39
12	2001	2, 3	19, 22		47
13	2002	4, 9, 14	27		54
14	2003	16	36, 50	52	154
15	2004	2	22, 24, 27		75
16	2005	6, 11	26, 36		79

領先國家金牌數目比較 (1999~2005)

屆次	16	15	14	13	12	11	10	總計	平均
台灣	2	1	1	3	2	3	3	15	2.1
中國	4	2	3	3	3	2	3	20	2.9
南韓	3	1	1	3	3	4	1	16	2.3
泰國	3	1	3	1	2	0	1	11	1.6
新加坡	1	2	1	2	2	-	-	8	1.6
美國	2	4	0	-	-	-	-	6	2.0
英國	1	2	0	2	0	0	0	5	0.7
總 數	20	16	17	16	17	16	13		

其他強隊：德國、澳洲、印度、俄國、烏克蘭、白俄

新進隊伍：西班牙、巴基斯坦



生奧培訓：蛋白質-酵素-抗體

在三天課程裡，我們將討論蛋白質及酵素的構造功能，以及巨分子的源起，以期有自 DNA 經 RNA 到蛋白質體的全方位觀念，是現代生物學的分子核心。另外介紹神奇的抗體，是生物免疫系統的主要戰力，也是重要的蛋白質工具。每天除了早上講習外，下午安排實習觀摩，雖然無法每樣都讓同學親手操作，但至少可以看過一次蛋白質、酵素及細胞方面的基本實驗手法。

預定把理論導入實驗，設計一個實驗題來考驗國手的理解能力。

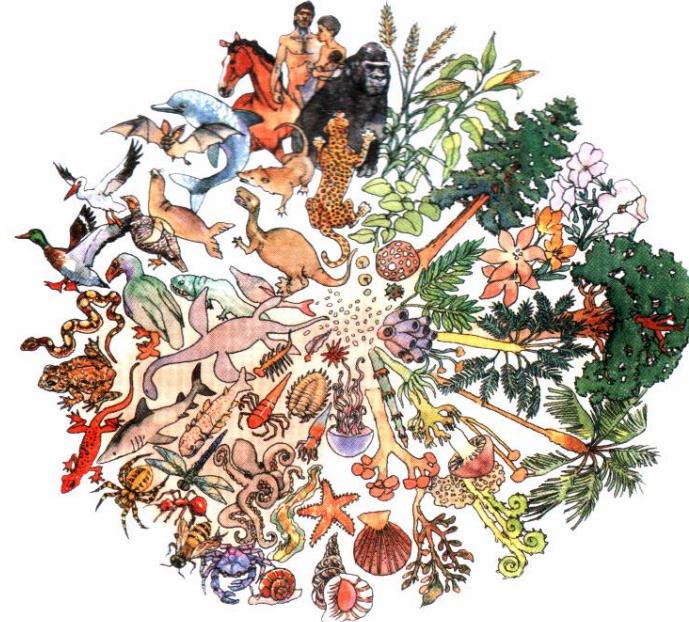


時 間	5/18 (三)	5/19 (四)	5/20 (五)	地 點
9:00~12:00 講 習	基礎生物化學 自大爆炸開始，先說明生命分子如何產生，然後回到胺基酸構造，把蛋白質一級級組合，說明其生理功能與分子構形之間的關係。	酵 素 酵素構造與其功能間有密切關係，同時也有複雜的調節機制，以便流暢地進行細胞內各種生理機能，可說是維持生命的奈米機器。	單株抗體 抗體是很特殊的一種功能蛋白質，可與其專一性抗原結合，並且產生免疫反應。單株抗體是人工產生的，有非常高的專一性與應用。	AC2-509
12:00~14:00	休 息			AC2-509
14:00~16:00 實 習	酵素抽取 硫酸銨分離及離心定量及分析	色層分析法 離子交換法 電泳轉印	細胞培養 單株抗體生產 動物細胞培養	AC2-520 & AC2-207
16:00~17:00	整合 討 論			AC2-509
附 註	請同學把最想知道的問題，或不明白的地方整理出來，隨時以 e-mail 寄給莊榮輝，以便在講習時加強說明。			15

生奧培訓感想 (I)

生奧部份

- 一、生奧標榜的創造性推理與學生交流極為值得肯定。
- 二、台灣應展現自有風格：自信、開朗、認真、文雅。
- 三、把生奧看做一般國際活動，不必汲汲營營奪獎牌。
- 四、台灣高中生物教育可參考生奧規劃的範圍與精神。
- 五、以生奧競試模式帶動國內的生物教育方向與交流。



天下文化：觀念生物學 The Way Life Works (Hoagland & Dodson)



生奧培訓感想 (II)

研究生涯：搶救貧窮 - Microsoft Internet Explorer

檔案(E) 編輯(E) 檢視(V) 我的最愛(A) 工具(I) 說明(H)

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網址(D) http://juang bst.ntu.edu.tw/art%20science/daily04.htm 移至 連結

上一則 研究生涯 下一則

(4) 「搶救貧窮大作戰」與 電視冠軍



對這兩個日本綜藝節目的印象非常深刻。「電視冠軍」找來各行各業的頂尖人物，在製作單位規劃下的制度比賽，其專業、認真與戲劇性，好像是「武士道」的再現。「搶救貧窮大作戰」剛好相反，由「瀕臨破產」的各種店家提出申請援救，製作單位在瞭解問題之後，提出中肯的搶救方法，要老闆去名店修業，以便起死回生，在修業過程中一定會把老闆弄哭。

兩個節目看來好像南轅北轍、互不相干，其實隱隱約約可以嗅到日本人所自豪的「敬業」精神，凡事求其認真、踏實與追求完美的任性。小時候，常會偷聽到老先生們在聊天，當談到日本人的時候，通常都會先數落一番，說日本鬼子小氣、有禮無體、狗眼看人低、島國根性、做事龜毛等等，最後就慢慢讚嘆起日本人做事情的認真態度，說他們如何把台灣的水利、電化、戶政、交通系統等做有條理的建設，言語中還充滿懷念。



短期看來，應該是明治維新的功勞，日本人在鎖國幾百年之後，首度見識到歐美國家的強盛，剛好也出現很多有識之士，一起打造明治盛事。長期而言，我覺得日本文化好像是唐朝文化的「活化石」，當中國經歷幾個越來越衰敗的朝代之後，日本因為鎖國的關係，反而保留了唐文化之精髓，而那幾乎是中國文化當

研究生涯 home - Microsoft Internet Explorer

檔案(E) 編輯(E) 檢視(V) 我的最愛(A) 工具(I) 說明(H)

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研究生涯

Scientific Career



緣起 *In the beginning ...*

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	(5) 一定要把自己的英文能力建立好	2005/02/28
	(6) 論文打字、排版、參考文獻不能出錯	2005/02/28
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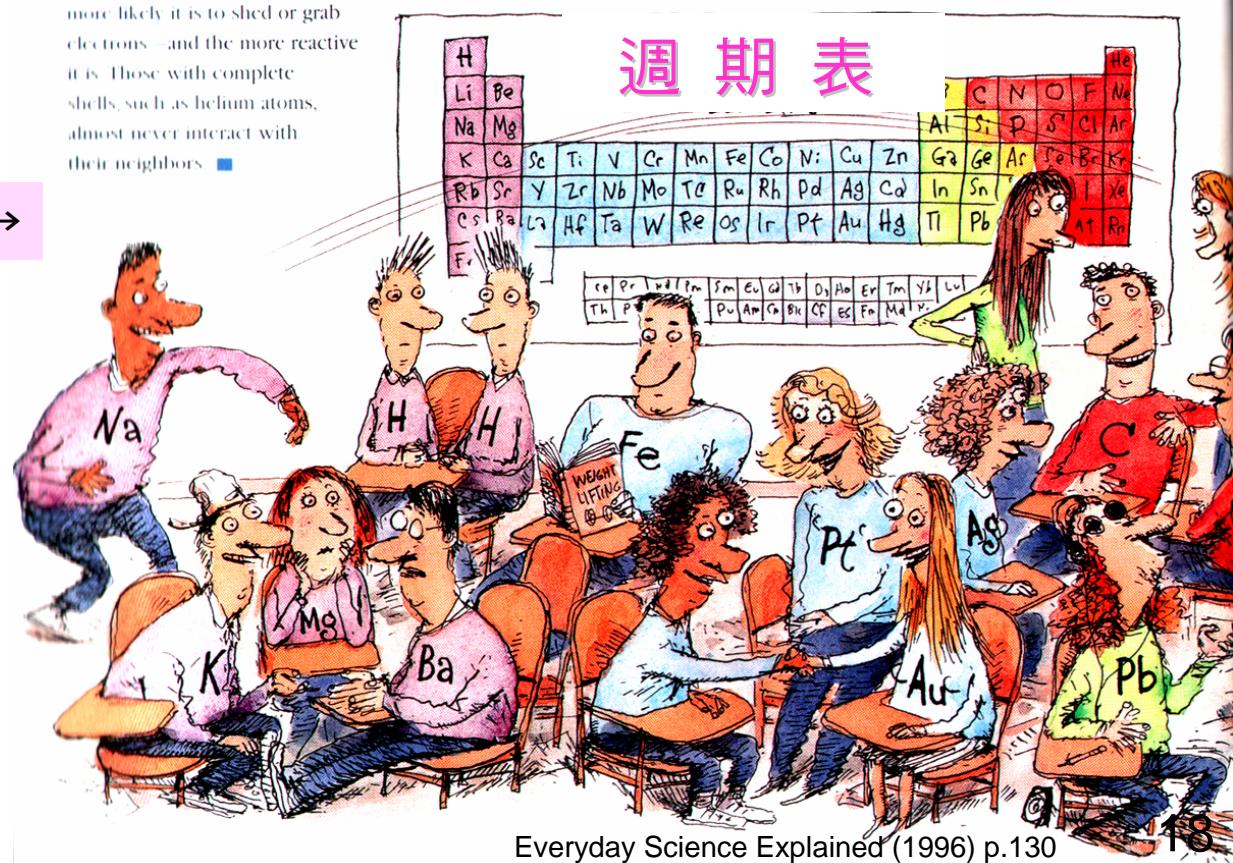
生奧培訓感想 (III)

菁英教育

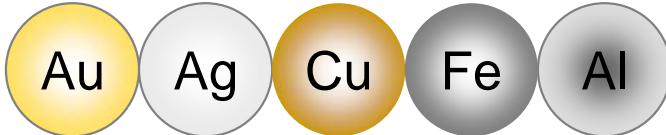
- 一、人生而不平等，教育旨在幫學生找到自己的特質。
- 二、菁英教育不可免，需提供特殊環境培養傑出人才。
- 三、社會菁英將肩挑重大責任，必須發展更完整人格。
- 四、要發掘並珍惜特殊人才，他們較特立獨行且敏感。

more likely it is to shed or grab electrons—and the more reactive it is. Those with complete shells, such as helium atoms, almost never interact with their neighbors. ■

週期表適用於全宇宙→



週期表上的每一種元素
都有其自身特性與功能



生奧培訓感想 (IV)

培訓部份

- 一、國手的知識水準已達生命科學碩士班學生的程度。
- 二、大部分國手都較外向、活潑、有自信，稍缺人情。
- 三、部份國手相當勇於回應教師的挑戰，並主動發問。
- 四、大部分國手對本培訓內容有相當的興趣與參與感。
- 五、以上優點有逐年衰退趨勢，可能受整體環境影響。

科學精神

勇於面對未知
創造性的思考
正直樂觀人格



科學之路 The philosophical aspects for science

1	準備工作
2	實驗
3	機遇
4	假設
5	想像力
6	直覺
7	推理
8	觀察
9	困難
10	戰略與戰術
11	科學家

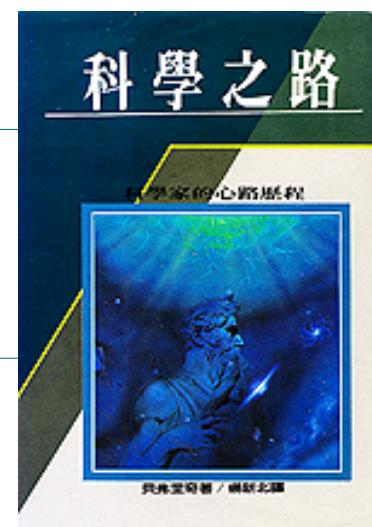
構成我們學習上最大障礙的是已知的東西，而不是未知的東西。

達爾文：『大自然一有機會就要說謊』

很多具有時代意義的發現先前都被提出過，只是未能繼續發展研究，直到適逢其人才得以正確展開。

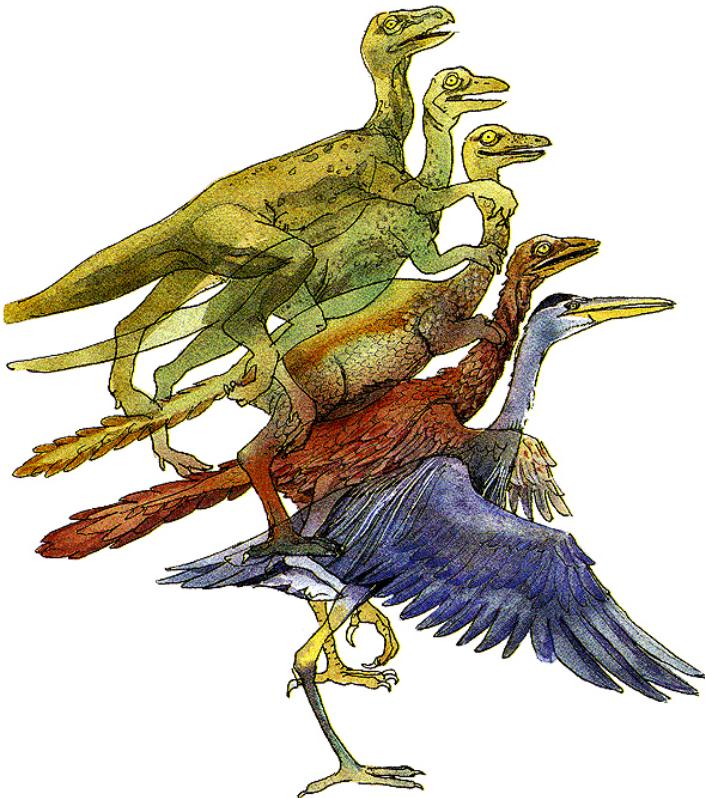
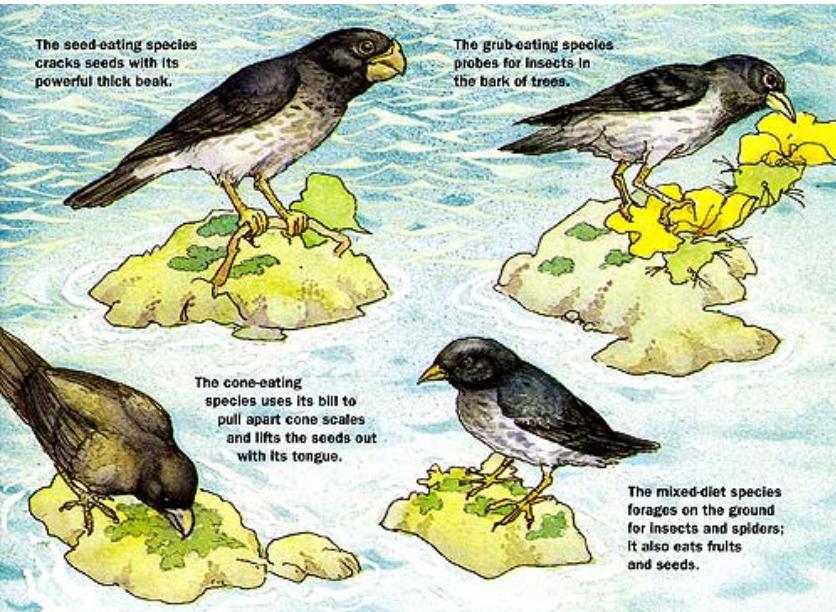
測定智力技能的最佳標準，可能是檢測其放棄謬誤的速度。

人們最出色的工作往往是在處於逆境的情況下做出來的



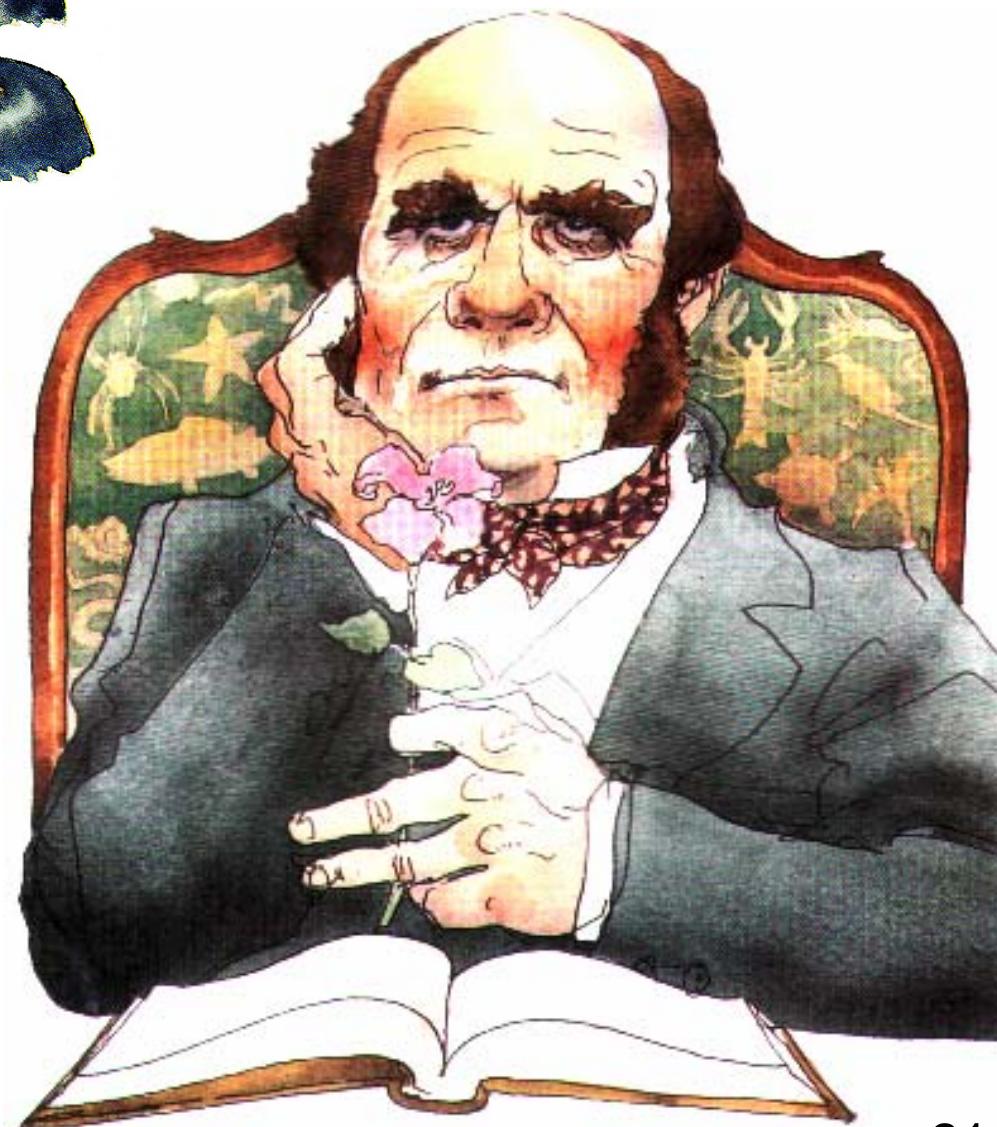
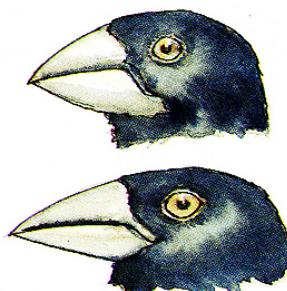
期望科學探索精神普遍在台灣生根

『貫古今』的超時空智者 - 達爾文



生命會改變形式以適應環境

Evolution !



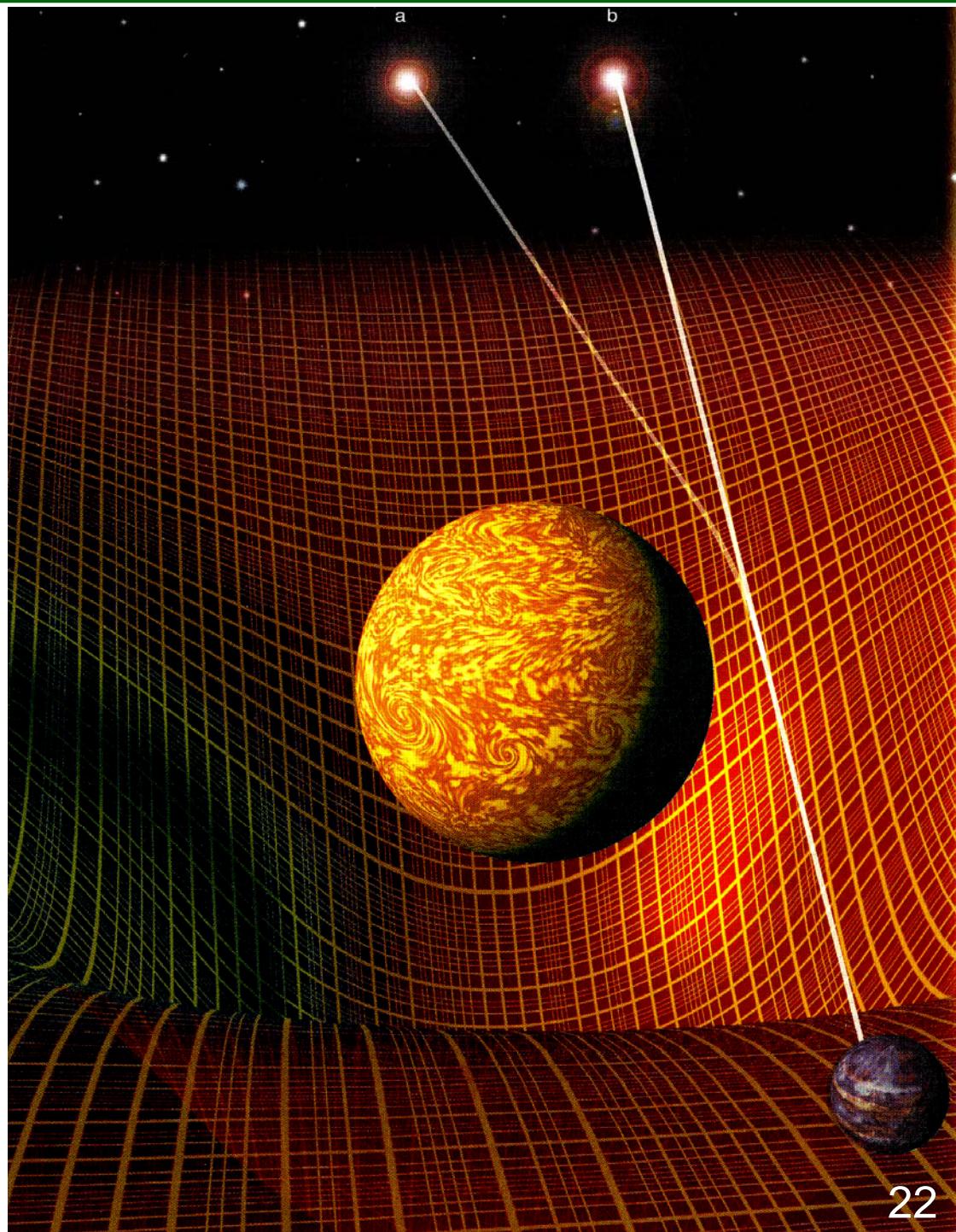
『通宇宙』的超時空智者 - 愛因斯坦

Space & Time !



Albert Einstein™

胡桃核裡的宇宙 The Universe in a Nutshell (S Hawking)



哥倫布發現新大陸也是一宗科學探索

想像力與勇氣的最好例證就是哥倫布的故事，它具有科學上第一流發現的很多特徵。

科學之路：第四章



- (1) 哥倫布全神考慮著一個想法：既然世界是圓的，他就能向西航行到達東方。
- (2) 這個想法絕非他的首創，但顯然他曾從一個水手那裏獲得了新的佐證，此人被大風刮離了航道，據他自己說，他在西方重登陸地，然後返航。
- (3) 他好不容易才得到資助，得以檢驗自己的想法；而且，在進行實驗性航行的實際過程中也歷盡了艱辛。
- (4) 最後成功的時候，他找到的不是預期的新航線，而是整整一個新大陸。
- (5) 任憑一切佐證對他不利，他仍然死死抱住自己的假設不放，並相信自己是找到了通往東方的航線。
- (6) 他生前所獲讚譽和酬報甚少，不論他自己或是別人都未充分認識他新發現的意義。
- (7) 以後曾有證據說明，他決不是到達美洲的第一個歐洲人。

Source: http://en.wikipedia.org/wiki/Christopher_Columbus;
<http://www1.minn.net/~keithp/ships.htm>

生奧培訓感想 (V)

生物學的意義

一、讓每個人瞭解，自己身為『生物』之一份子：

眾生平等 所有生物都用 ATCG 為遺傳密碼

萬物合一 生物之間的原子或分子可以互通

二、由生物學種種現象，學習人類社會應如何行為：

細胞社會 各分子不停為其個體努力工作 (我焉能怠惰?)

無限可能 生物經不斷變異求其生存 (生命的堅韌與珍貴)

生物法則 由生物法則去體會生命之常與無常 (豐富人生)

