築夢東華-分享個人經驗

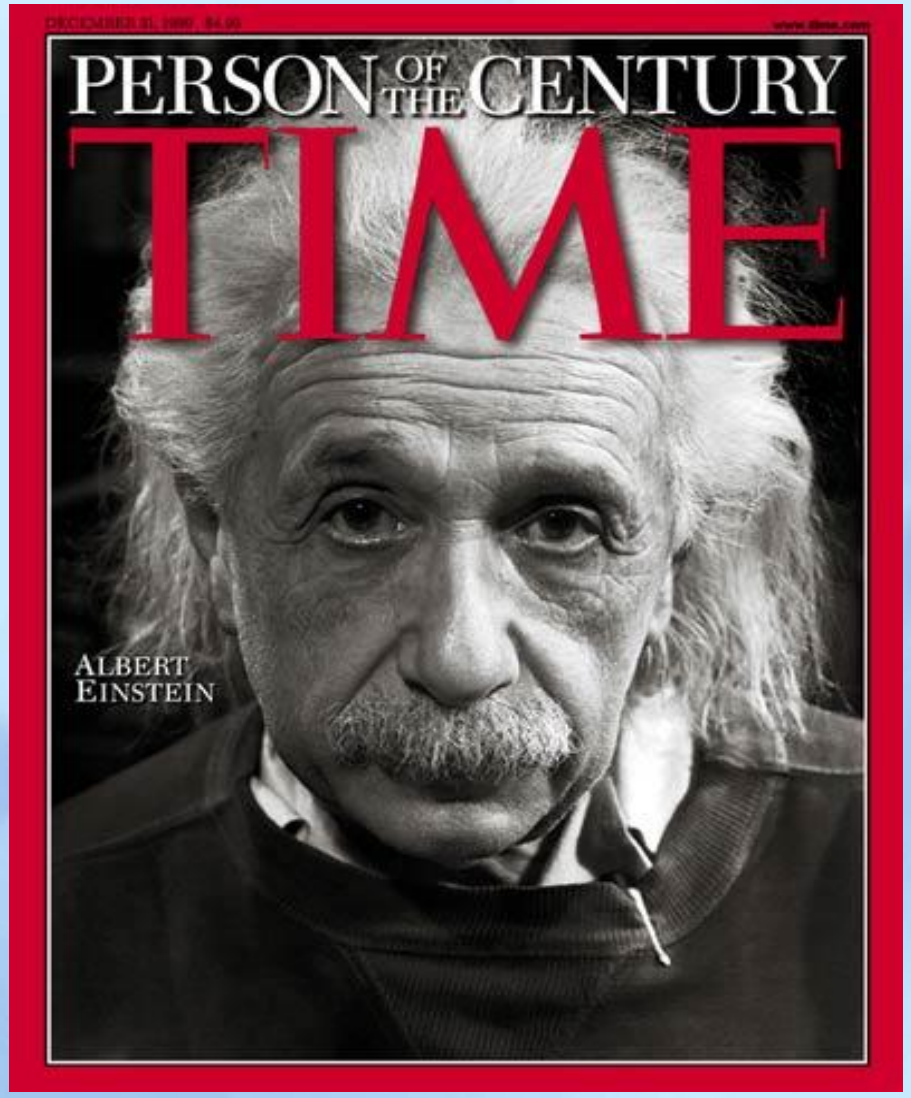
National Taiwan Normal University

講師：吳茂昆

前言

前言

前言



"Try to become not a man of success, but try rather to become a man of value."

~ Albert Einstein ~

前言

Einstein on Education

"Bear in mind that the wonderful things you learn in your schools are the work of many generations, produced by enthusiastic effort and infinite labor in every country of the world. All this is put into your hands as your inheritance in order that you may receive it, honor it, add to it, and one day faithfully hand it to your children. Thus do we mortals achieve immortality in the permanent things which we create in common"

前言

1824 1831	Victor Hugo (22) (29)	First Poet Collection The Hunchback of Notre Dame (鐘樓怪人)
1865	Mark Twain (30)	The Celebrated Jumping Frog of Calaveras County
1868	Dmitri Mendeleev (34)	Principles of Chemistry
1894 1898 1896	Marie Curie (27) (31) Bertrand Russell (24)	Ferromagnetism Discovery of Polonium German Social Democracy

前言

1905	Albert Einstein (25)	Photoelectric Effect Special Theory of Relativity
1912	Niels Bohr (27)	Quantum Theory
1924	Louis de Broglie (32)	Particle Wave
1925-1926	Erwin Schrodinger (37) Werner Heisenberg (24) Enrico Fermi (25) Wolfgang Pauli (25)	Wave Mechanics Quantum Mechanics Quantum Statistics

前言

1927	Paul Dirac (25)	Dirac Equation (Relativistic Q.M.)
1935	Hideki Yukawa (28)	Meson Theory
1942	Enrico Fermi (41)	Nuclear Reaction
1945-1947	Sinitiro Tomonaga (39) G. Schwinger (29) R. Feynman (29)	Quantum Electrodynamics
1956	Tsung-Dao Lee (29) Chen-Ning Yang (33)	Parity Violation

前言

1964	M. Gell-Mann (35)	Quark Theory
1961-67	S. Galshow (29) S. Weinberg (34) A. Salam (40)	Unified Theory of Electrodynamics and Weak Interaction
1966-85	Kao Kuen (33) Yuan-Tsze Lee (31) Steven Chu (35)	Optical fiber for communication Chemical dynamics Laser cooling

Innovations are from Youth!

一、個人經驗分享(一)

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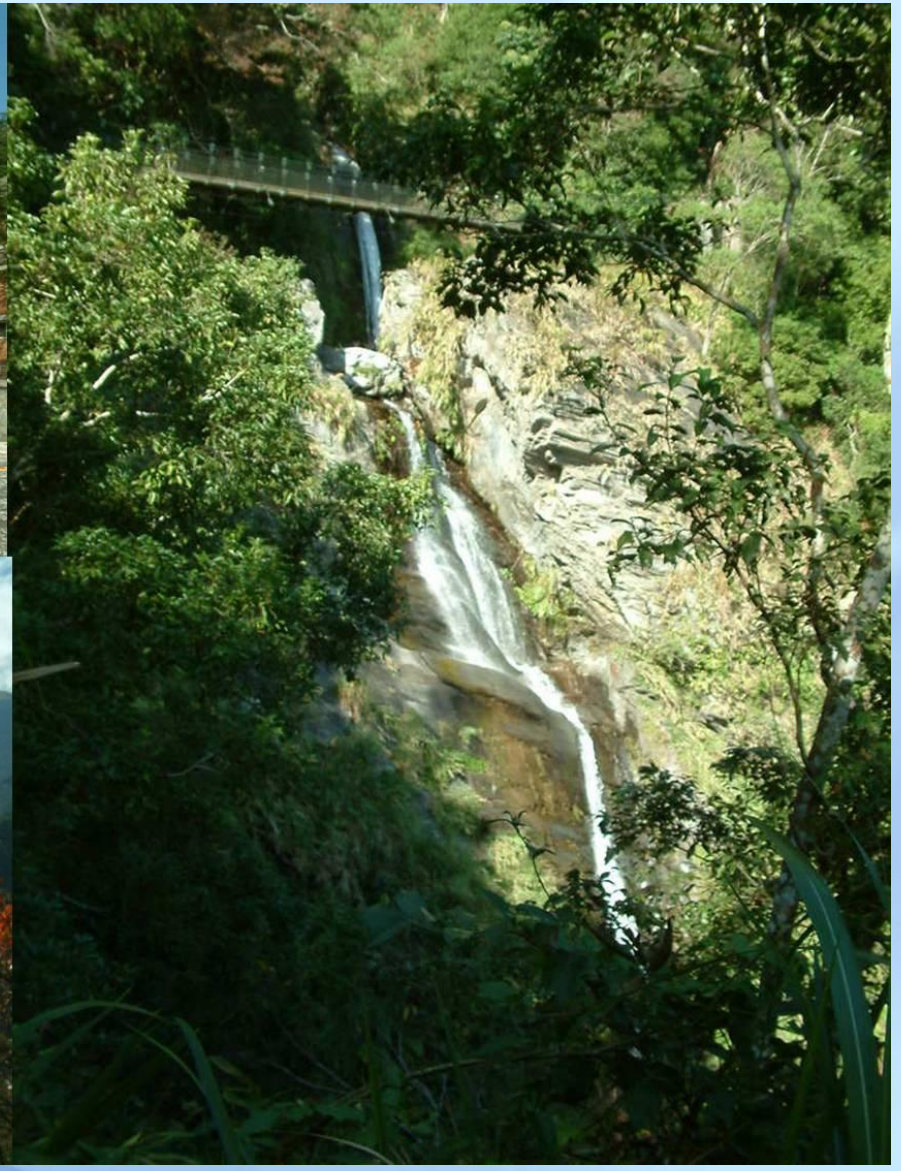
一、個人經驗分享(一)



一、個人經驗分享(一)

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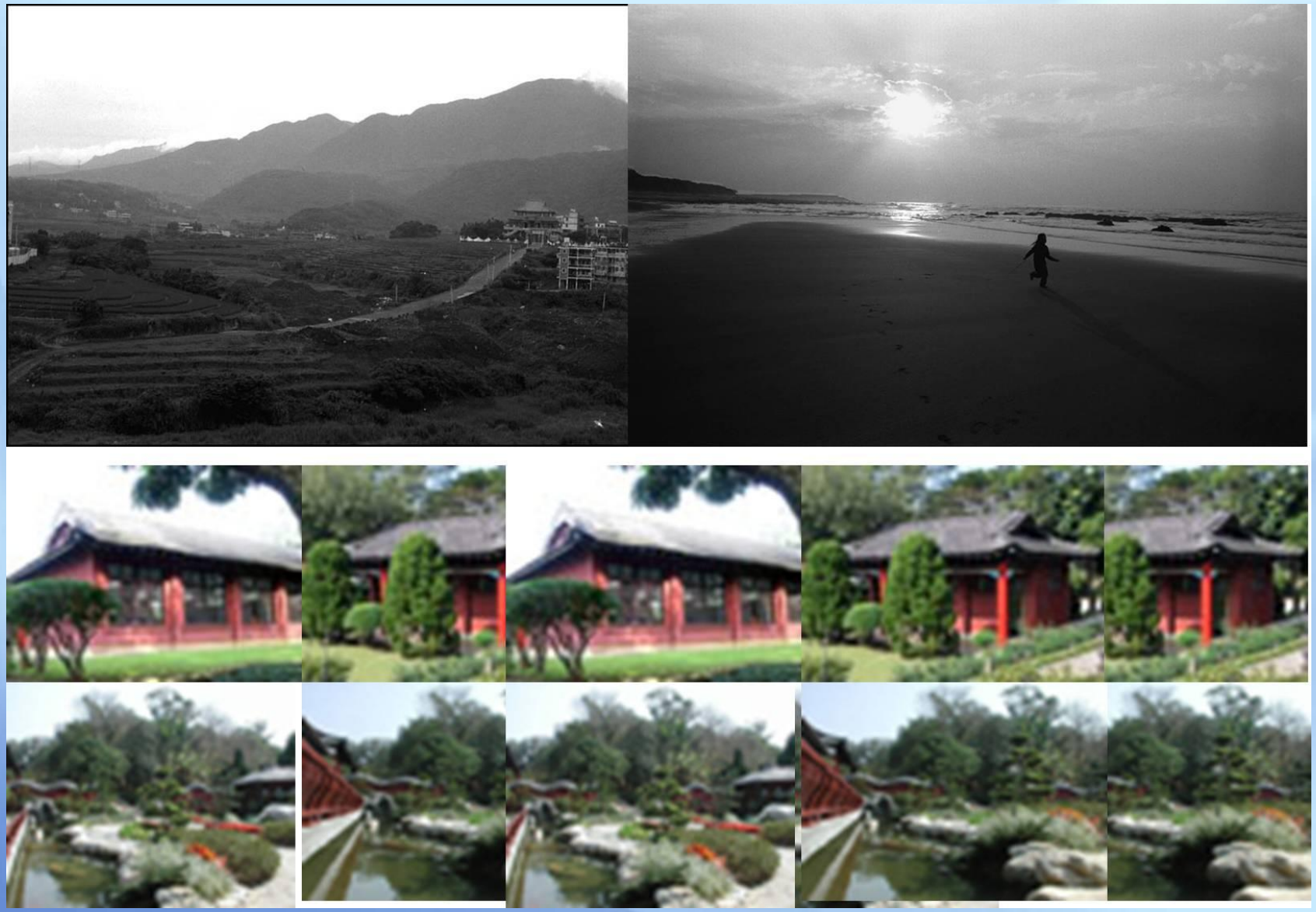

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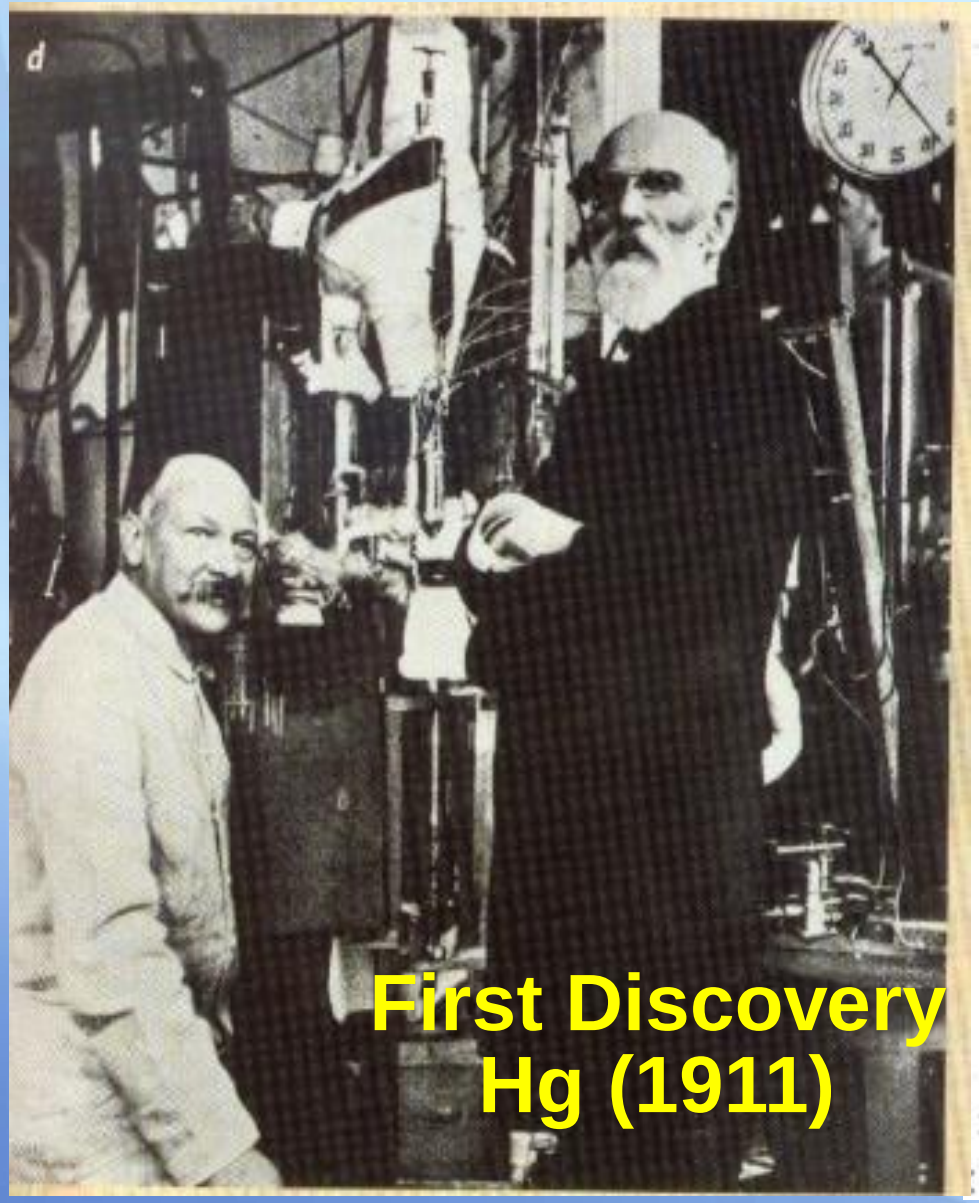
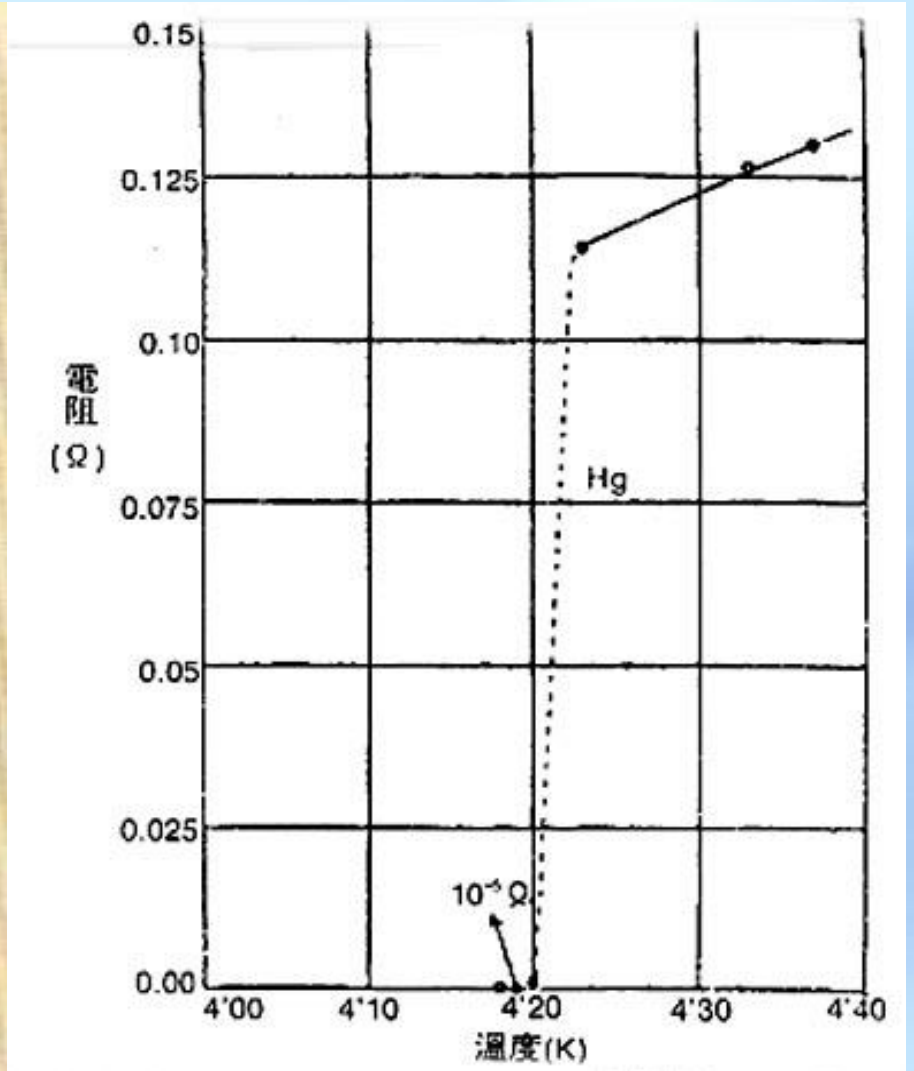
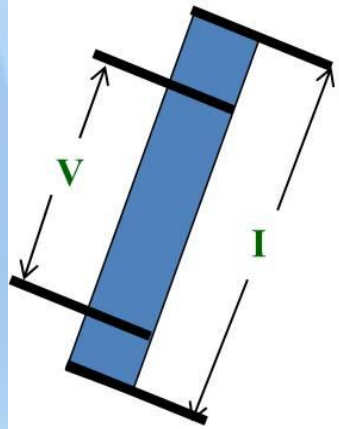




超導態首次發現:
Kamerlingh-Onnes測量汞的低溫電阻數據

一、個人經驗分享(一)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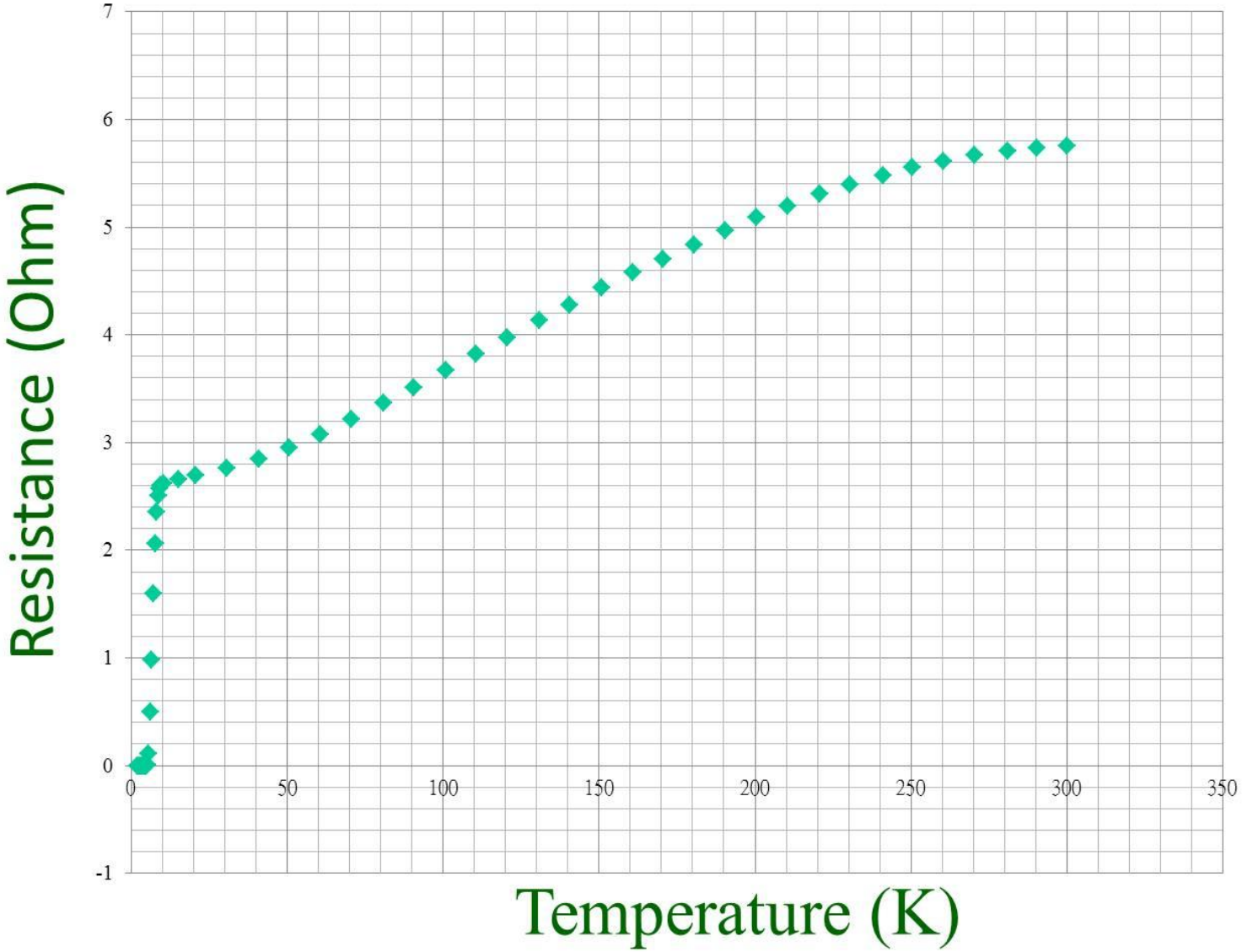
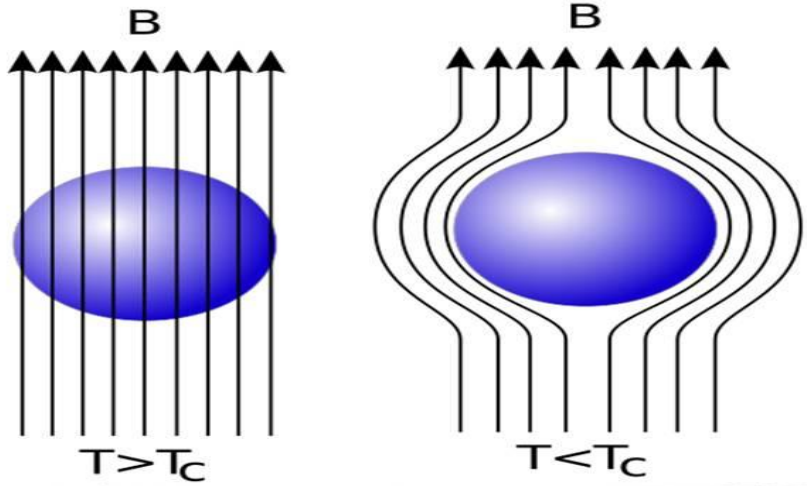
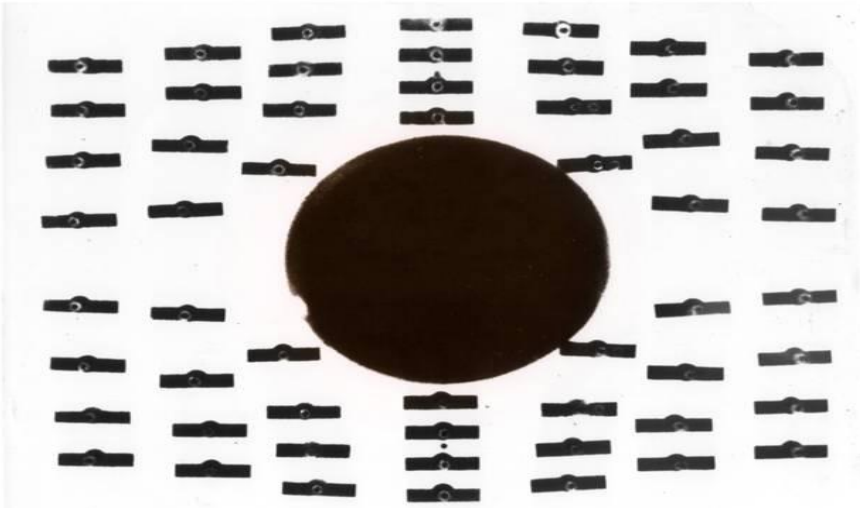
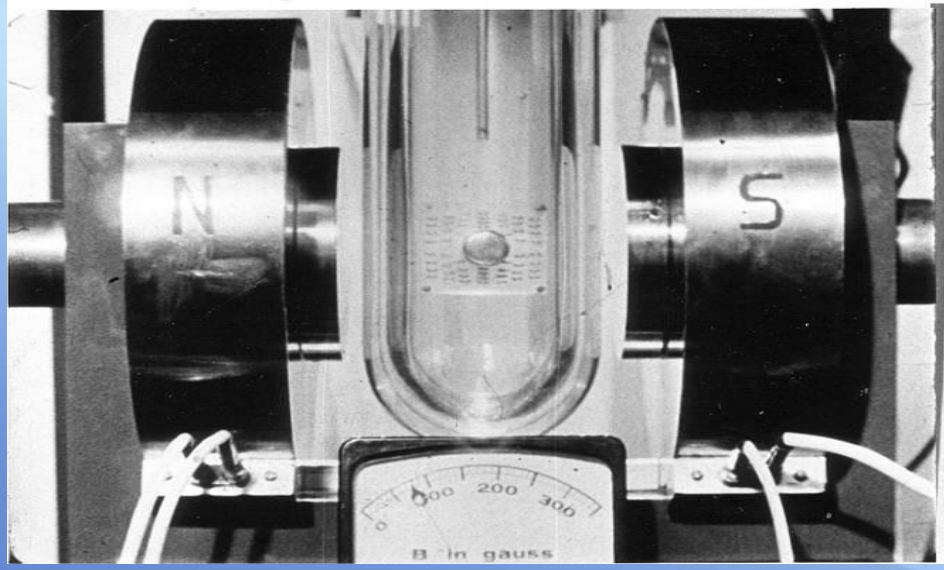

Resistance (Ohm)
7
6
5
4
3
2
1
0
-1
0
50
100
150
200
250
300
350
Temperature (K)

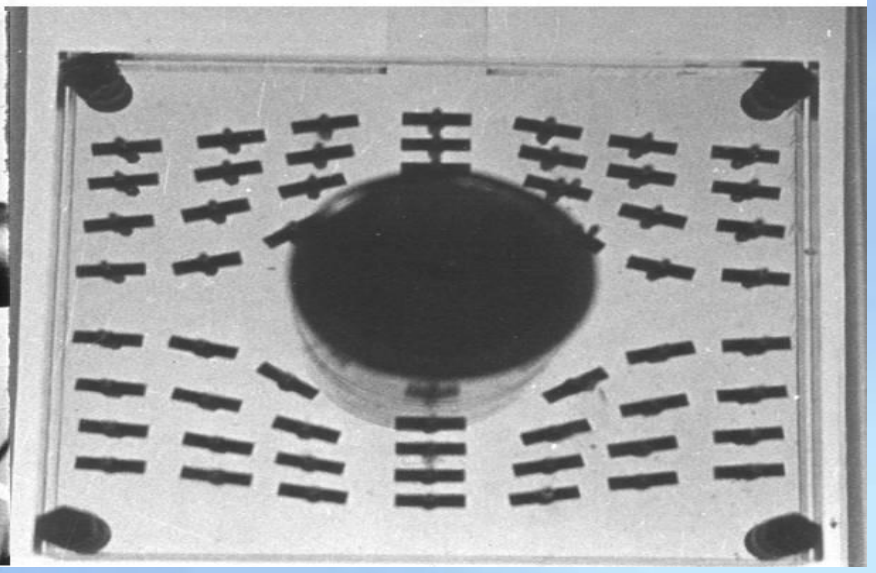
一、個人經驗分享(一)

超導抗磁效應(Meissner Effect)









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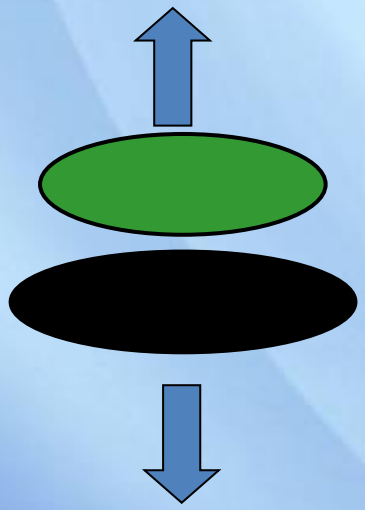
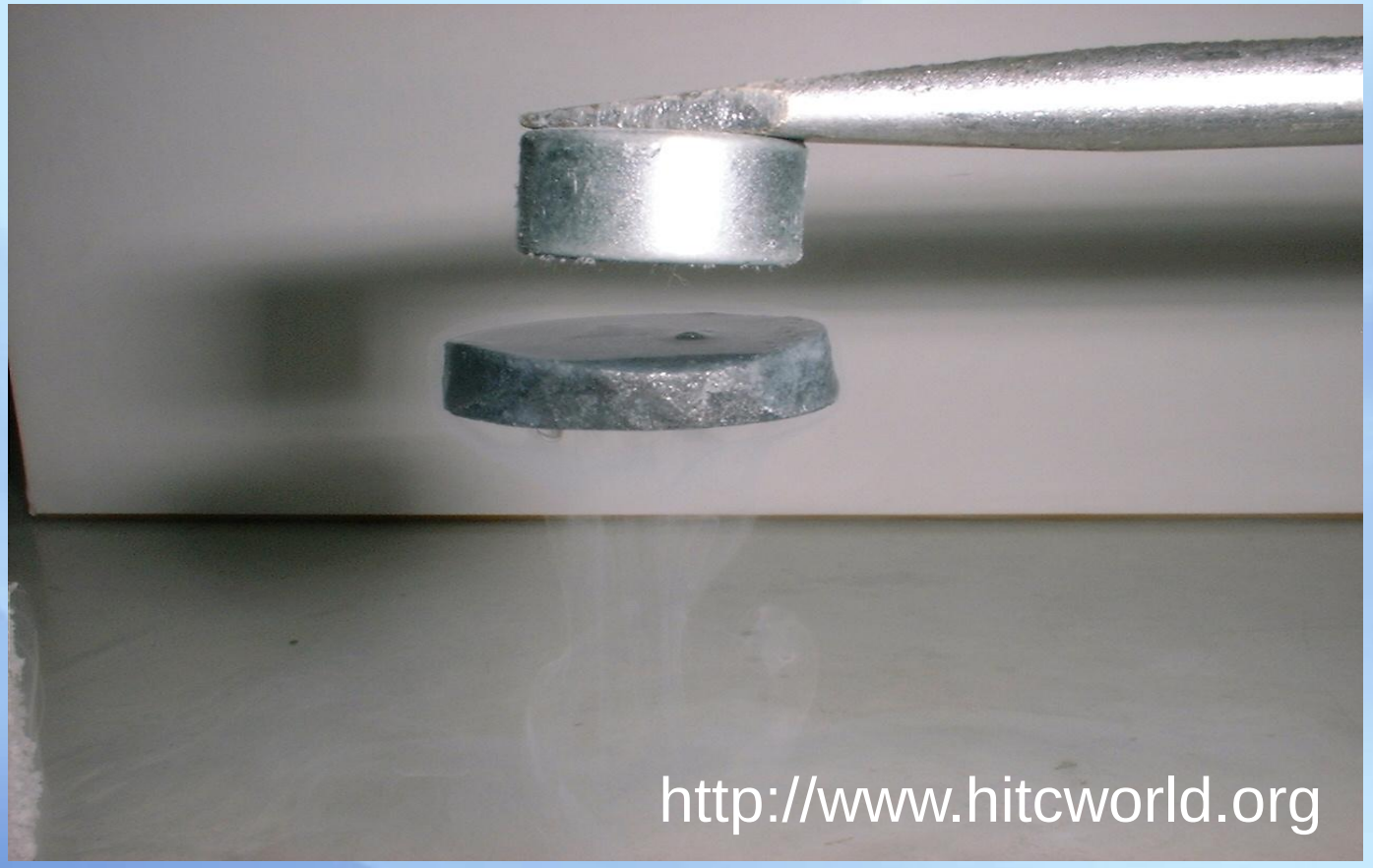
超導抗磁效應(Meissner Effect)





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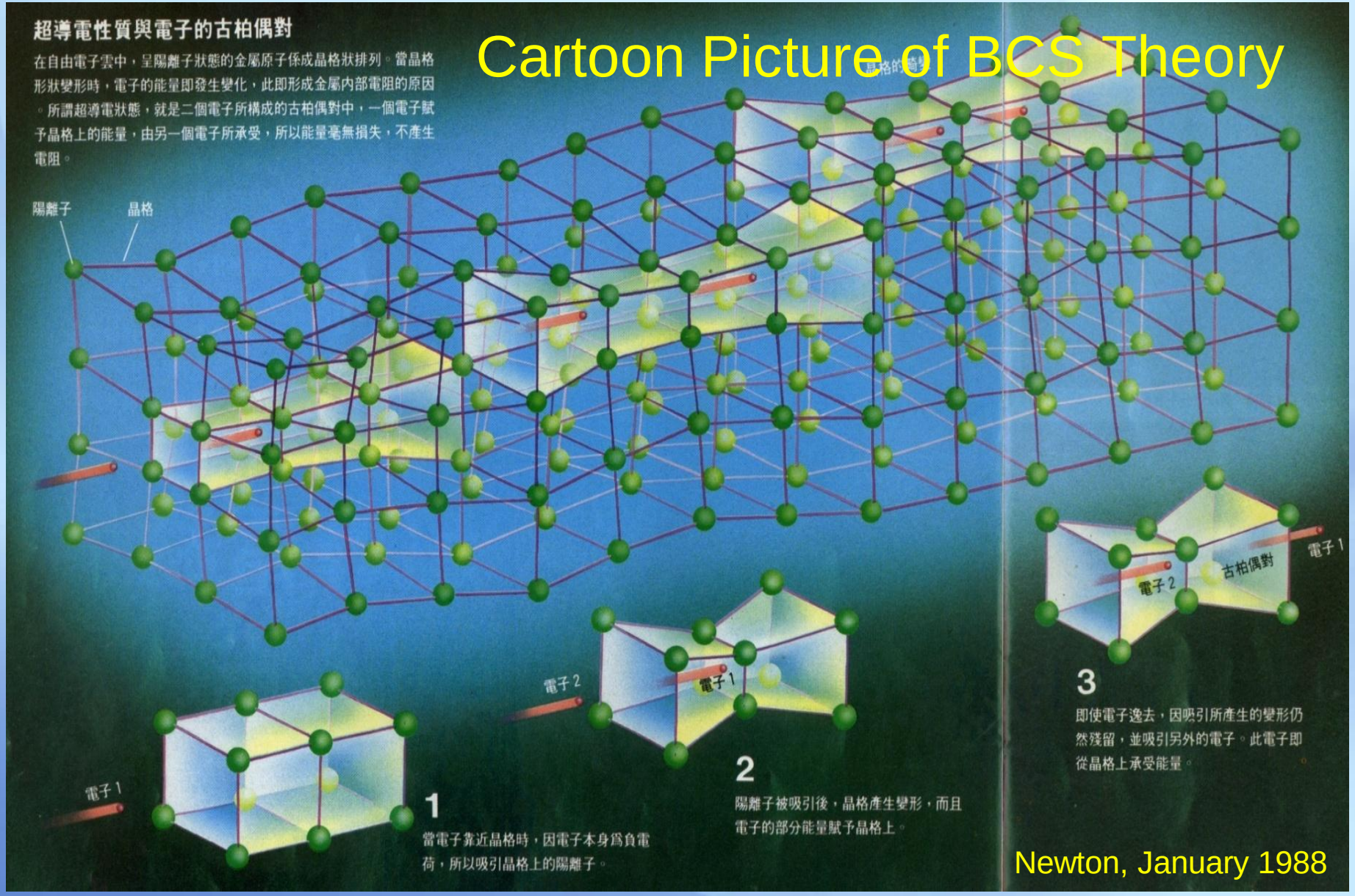
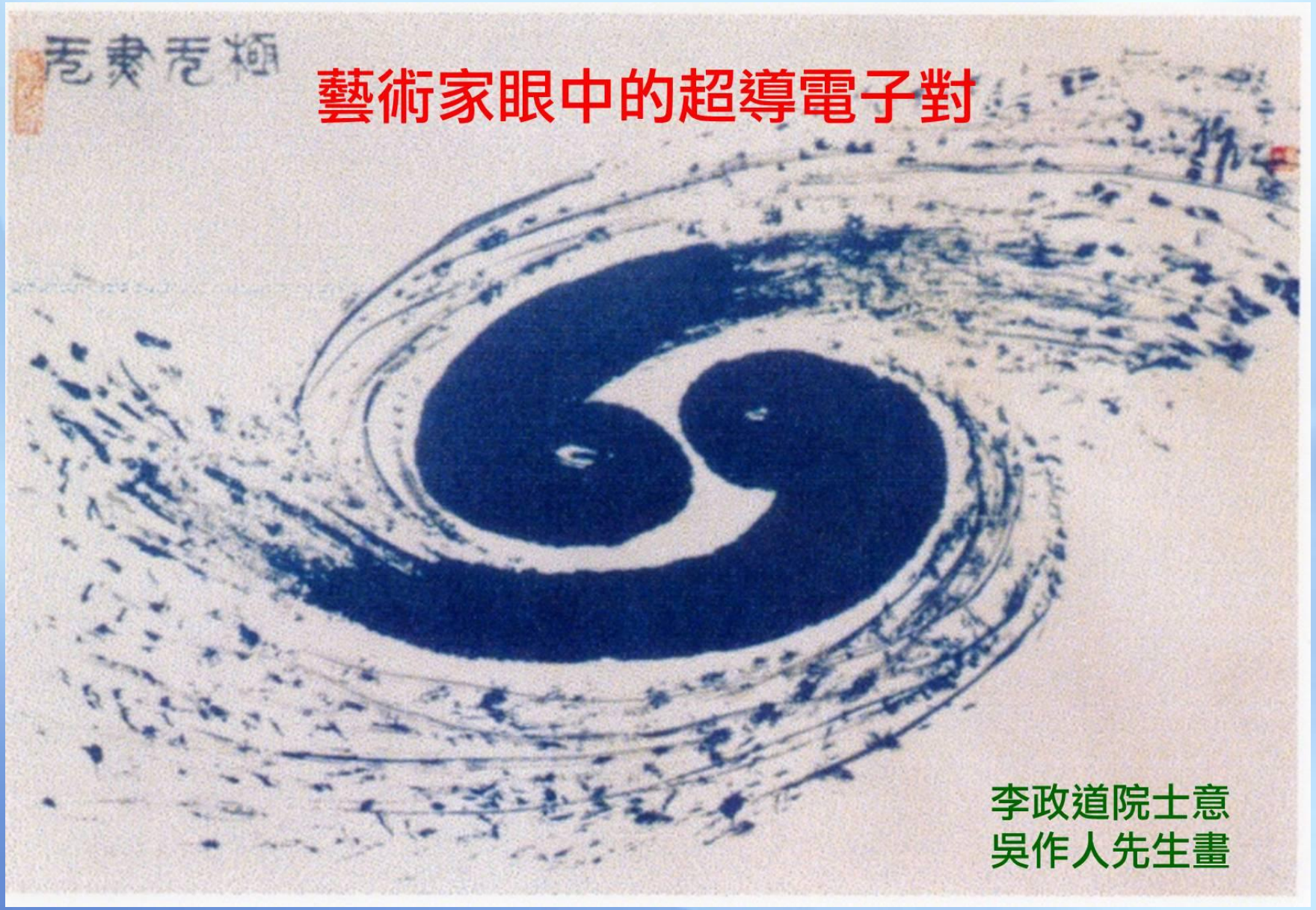

超導電性質與電子的古柏偶對
在自由電子雲中，呈陽離子狀態的金屬原子係成晶格狀排列。當晶格形狀變形時，電子的能量即發生變化，此即形成金屬內部電阻的原因。所謂超導電狀態，就是二個電子所構成的古柏偶對中，一個電子賦予晶格上的能量，由另一個電子所承受，所以能量毫無損失，不產生電阻。
Cartoon Picture of BCS Theory
陽離子
晶格
電子 1
電子 2
古柏偶對
1
當電子靠近晶格時，因電子本身爲負電荷，所以吸引晶格上的陽離子。
2
陽離子被吸引後，晶格產生變形，而且電子的部分能量賦予晶格上。
3
即使電子逸去，因吸引所產生的變形仍然殘留，並吸引另外的電子。此電子即從晶格上承受能量。
Newton, January 1988

一、個人經驗分享(一)



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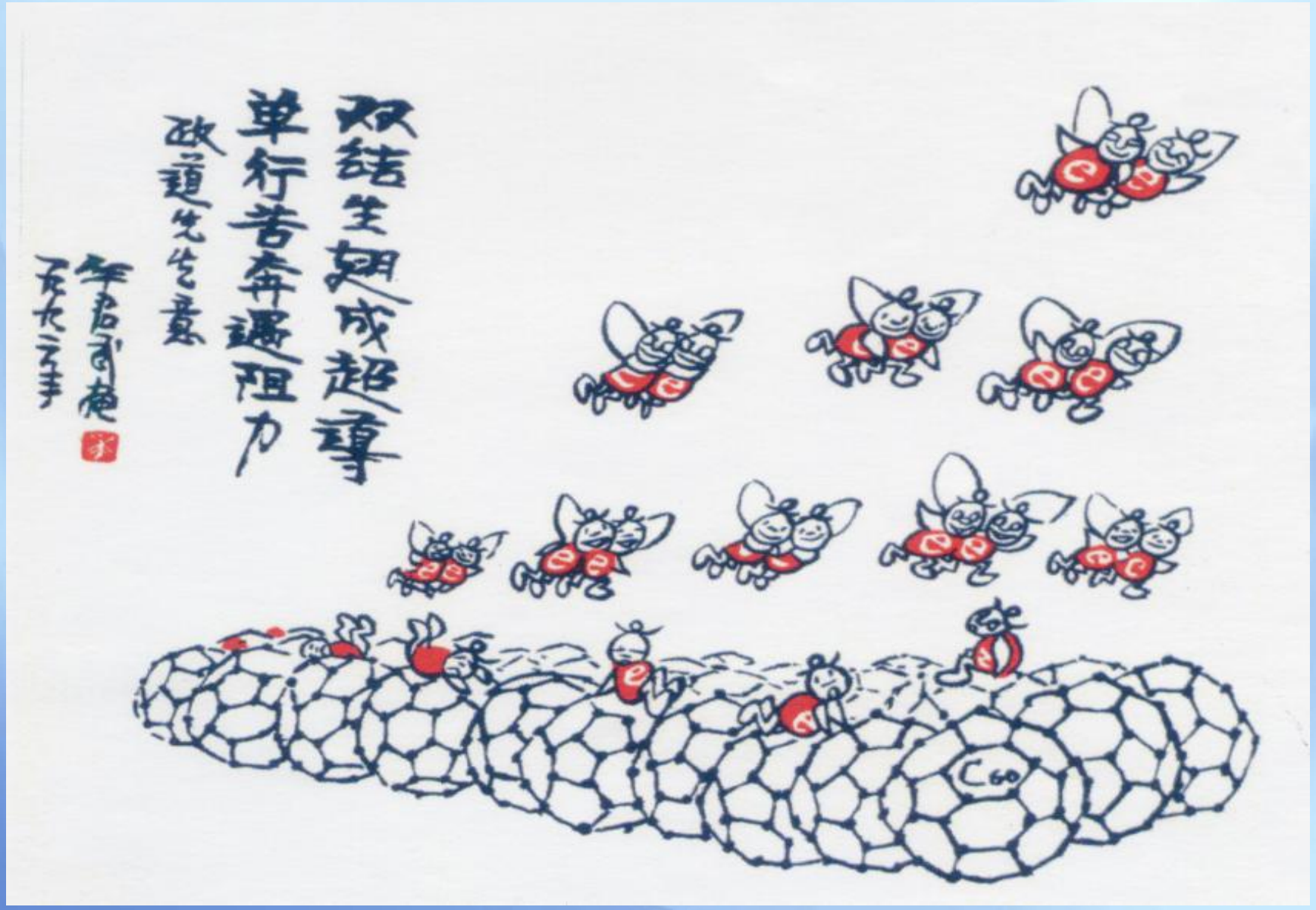
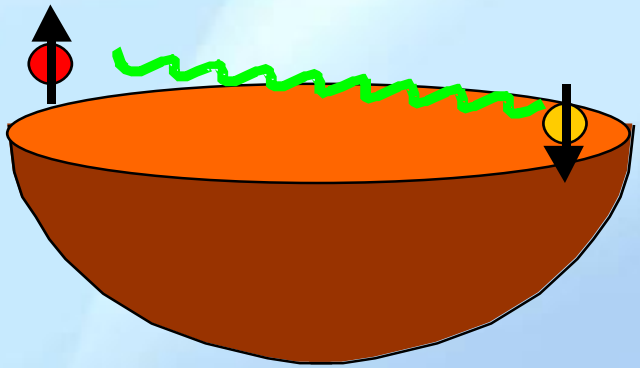


一、個人經驗分享(一)

BCS 超導理論

The Bardeen, Cooper, and Schrieffer (BCS) theory of superconductivity showed that even a weak attractive interaction between electrons (電子間的吸引力), as that caused by electron-phonon interaction, causes an instability of the ordinary Fermi-sea ground state of the electron gas with respect to formation of bound pairs of electrons (電子對) occupying states with equal and opposite momentum and spin.



Fermi Sea

Superconductivity is an instability of Fermi liquid caused by electron pairing, and a macroscopic quantum phenomenon.

$$k_B T_c \sim \hbar\omega_D \exp(-1/N(0)V)$$

一、個人經驗分享(一)

PHYSICAL REVIEW B VOLUME 7, NUMBER 3 1 FEBRUARY 1973

金屬—半導體介面

The exciton mechanism of superconductivity is discussed with respect to a particular model, a thin metal layer on a semiconductor surface. In this model, the metal electrons at the Fermi surface tunnel into the semiconductor gap where they interact with virtual excitons, producing a net attractive interaction among the electrons in direct analogy with the phonon mechanism of superconductivity. The physical requirements for successful realization of the exciton mechanism in a metal-semiconductor system are explored in detail, and the relevant parameters are described. Estimates are made for electron tunneling and band-bending effects, and an electron-exciton coupling constant is defined and estimated. Finally, an appropriately modified integral equation for the superconducting energy gap is solved numerically to yield transition temperatures both for a pure-exciton mechanism and for the exciton and phonon mechanisms acting simultaneously.

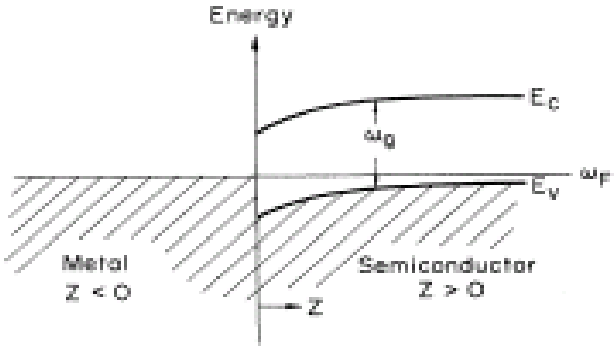
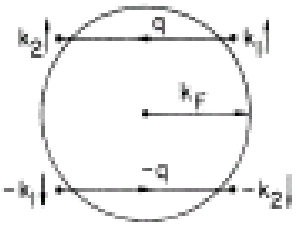
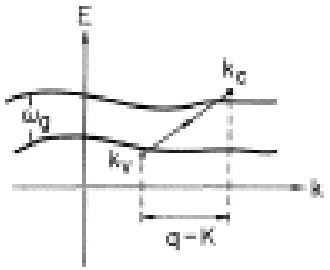


FIG. 1. Metal-semiconductor interface. E_c and E_v are the bottom of the conduction band and top of the valence band, respectively.



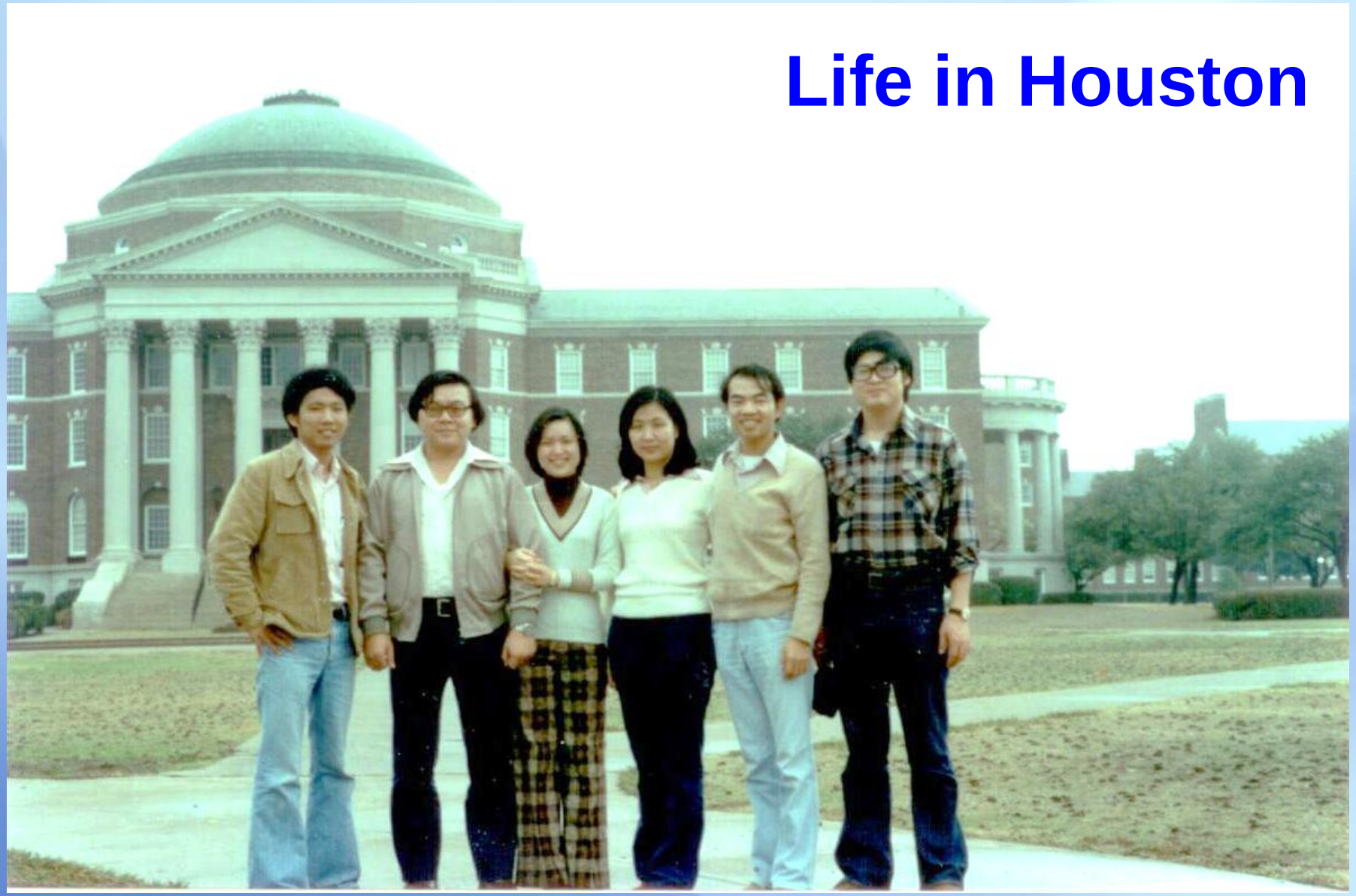
METAL'S FERMI SPHERE



SEMICONDUCTOR ENERGY DIAGRAM (REDUCED ZONE)

FIG. 4. Illustration of the exciton scattering process.

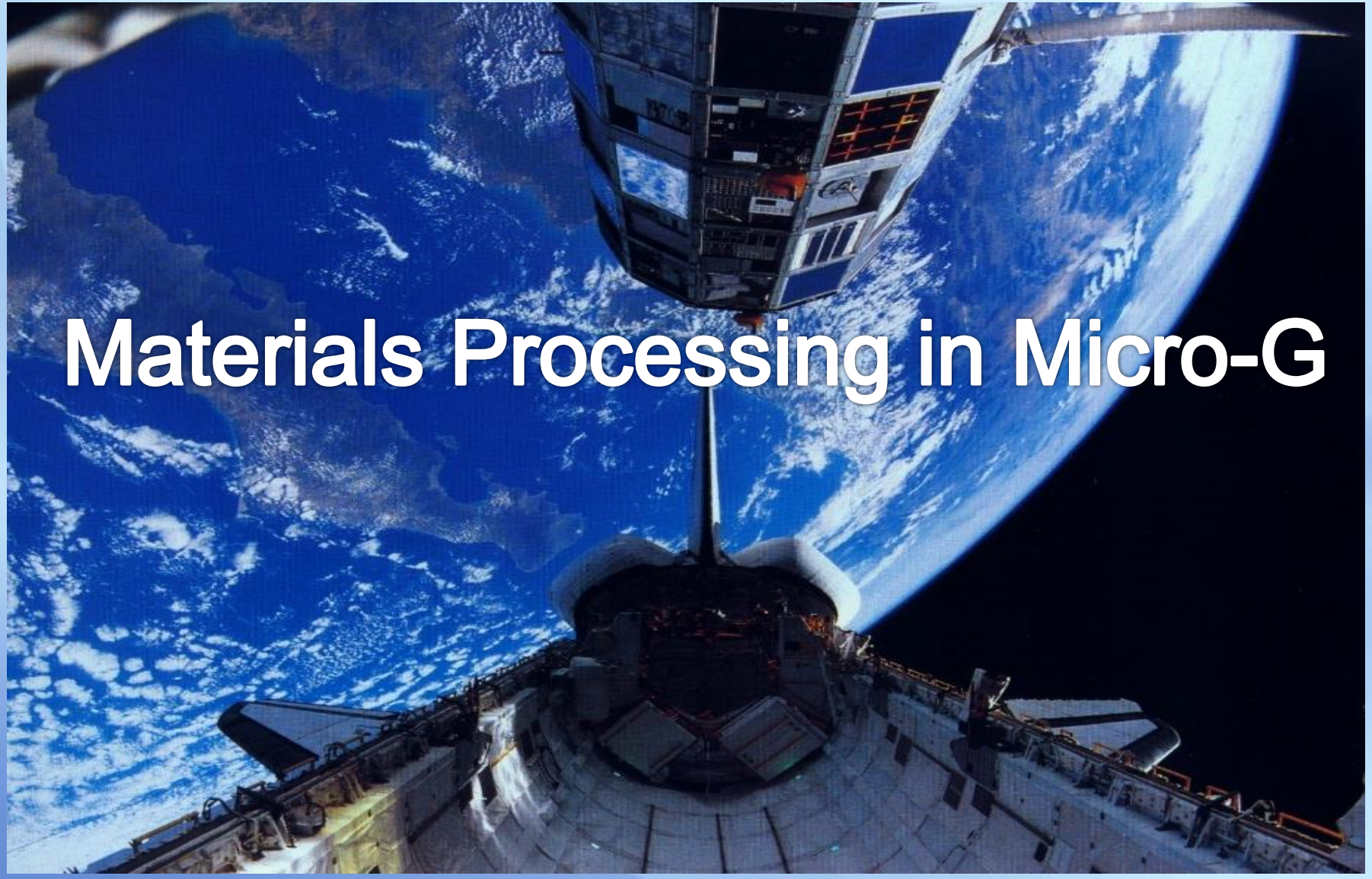
二、個人經驗分享(二)



二、個人經驗分享(二)

Materials Processing in Micro-G

二、個人經驗分享(二)



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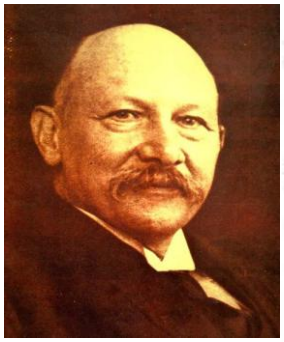
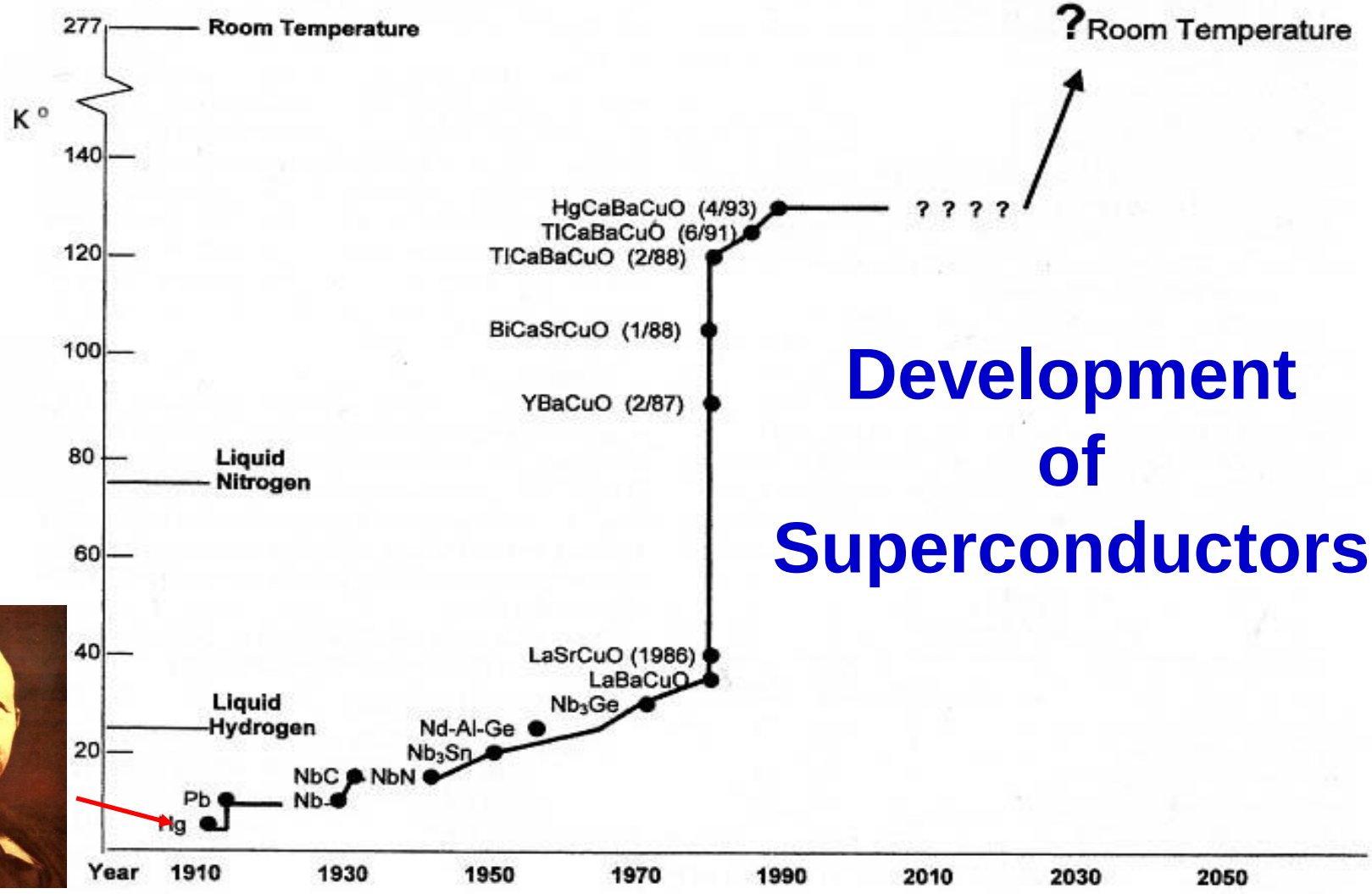


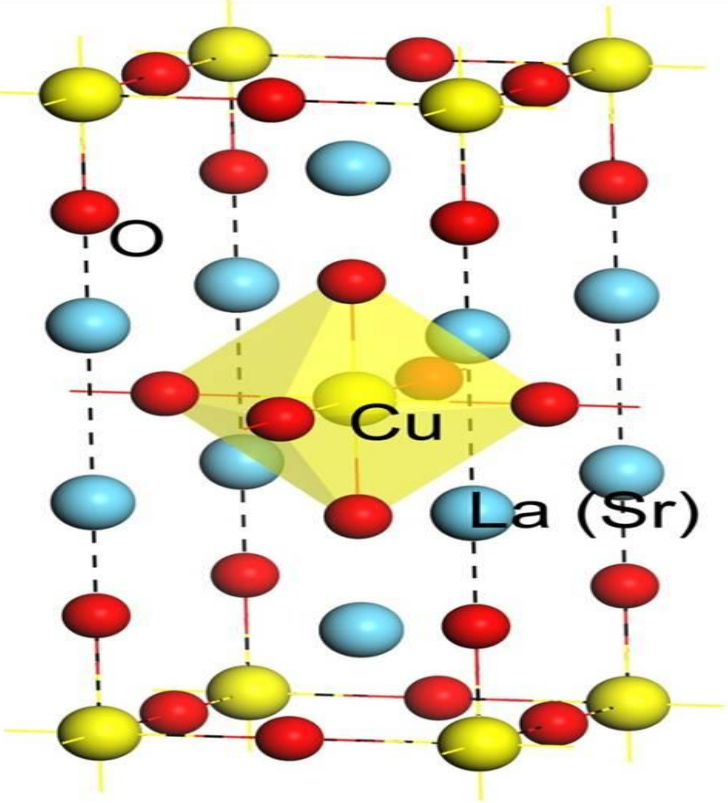
1913 Nobel



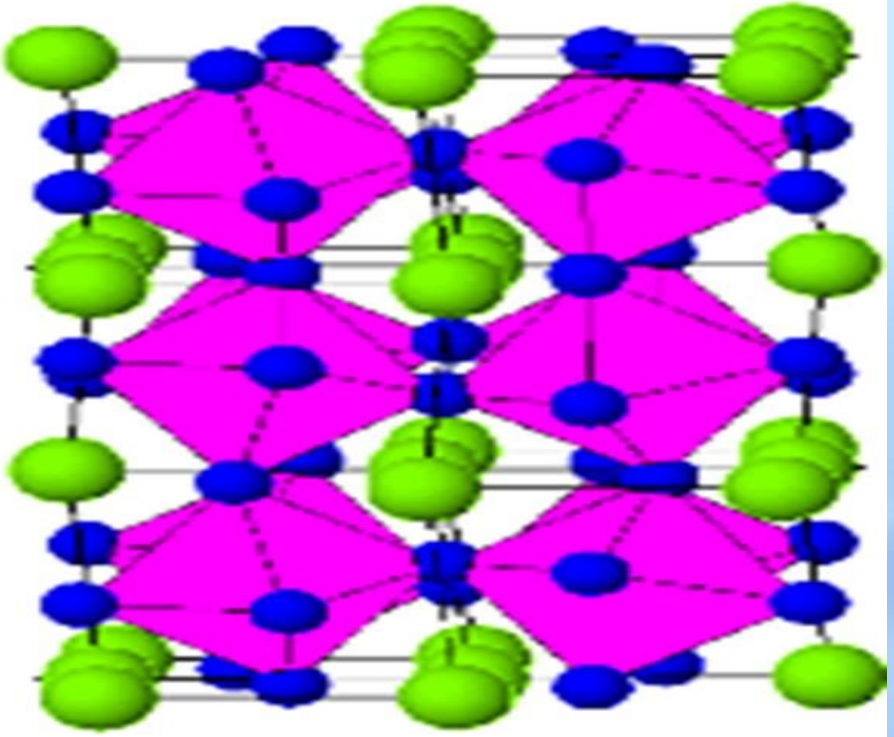
History of Discovery of Superconductors. Incerases in Critical Temperature. Vertical scale in degrees Kelvin.

Development of Superconductors

二、個人經驗分享(二)



La-Ba-Cu-O (214)



Distorted Perovskite with orthorhombic symmetry

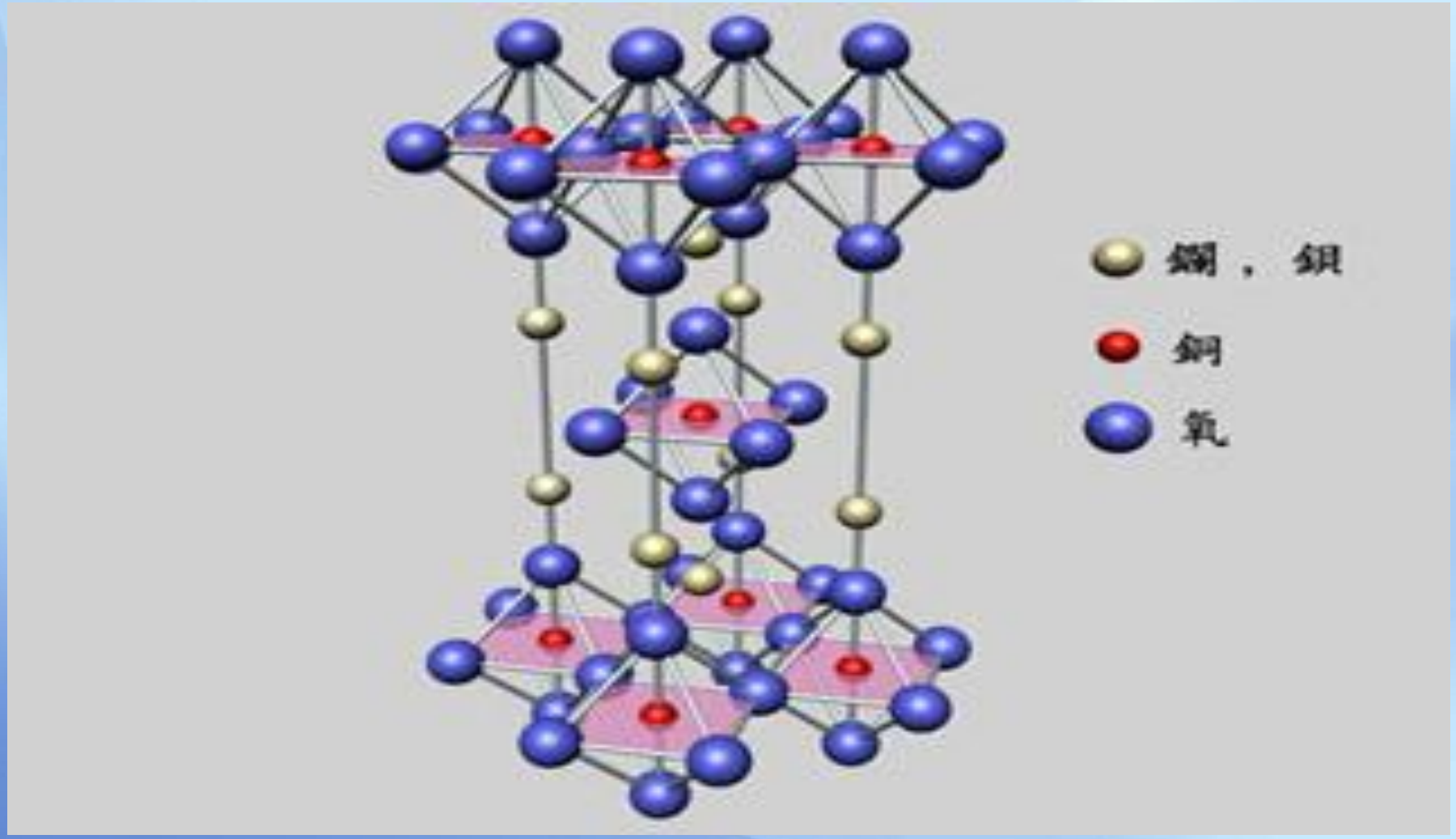
Perovskite ABO_3

$$t = (R_A + R_O) / \sqrt{2}(R_B + R_O)$$

t: Goldschmidst Tolerance Factor

二、個人經驗分享(二)

Discovery of Tc > 77K SC



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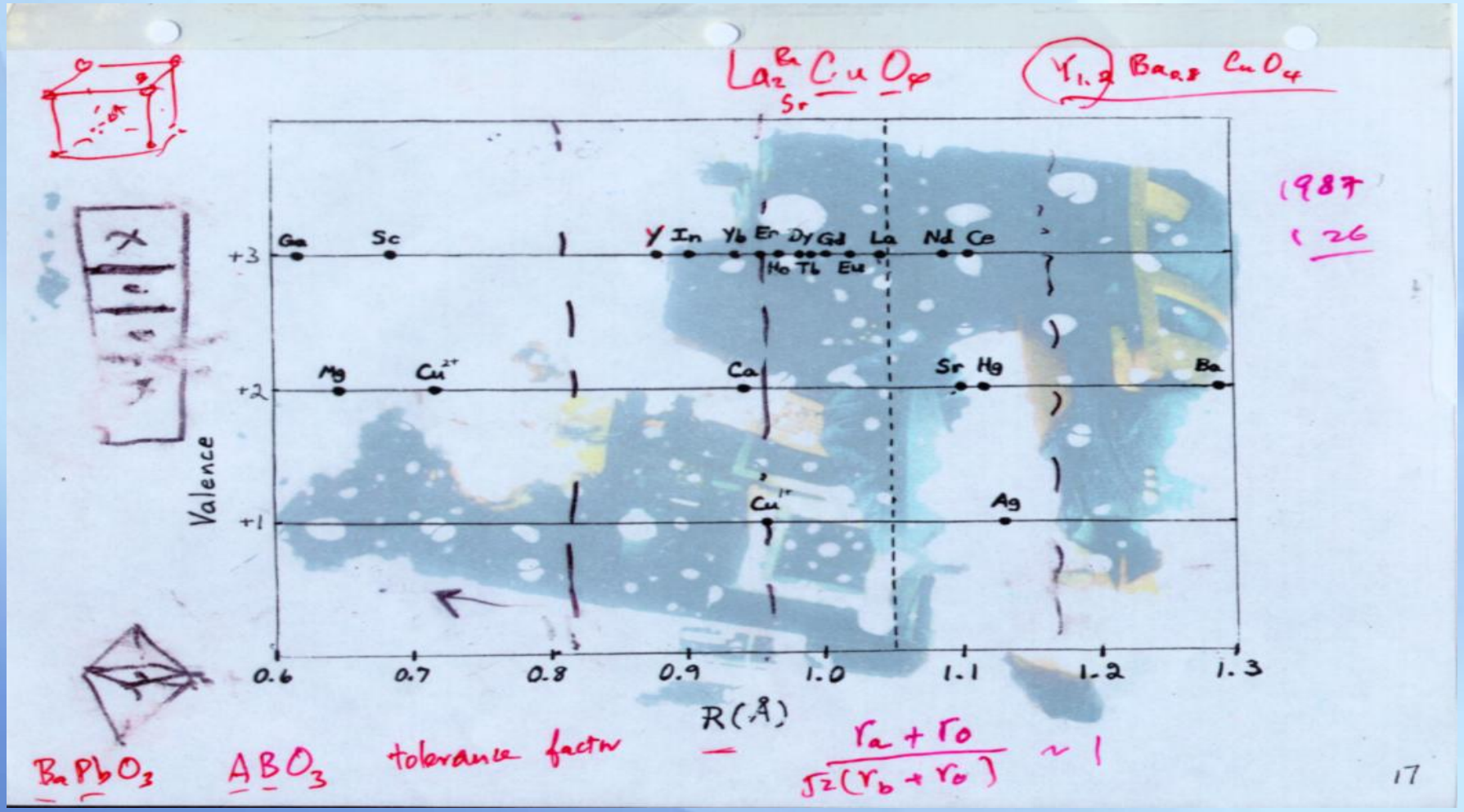

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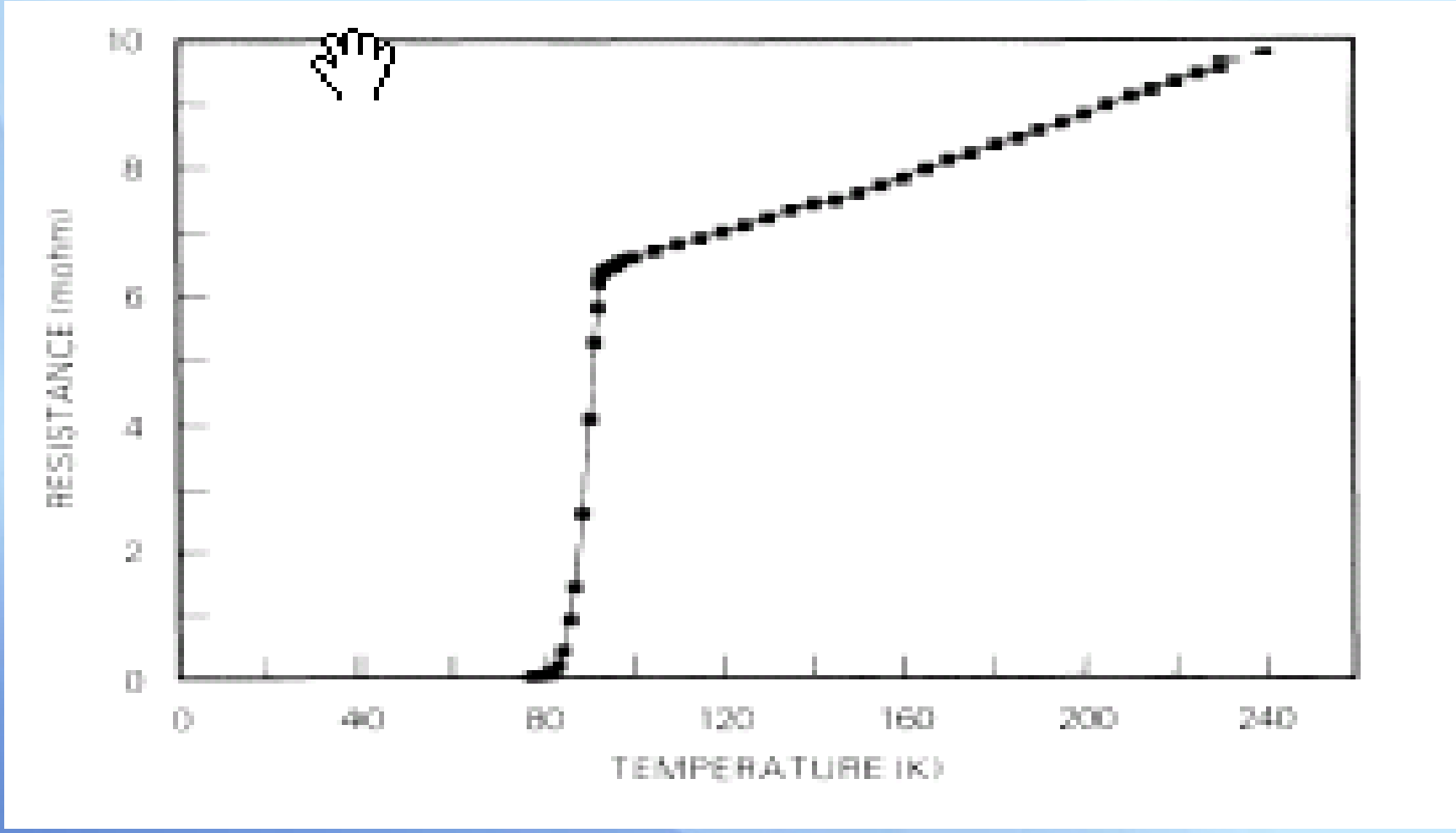

二、個人經驗分享(二)

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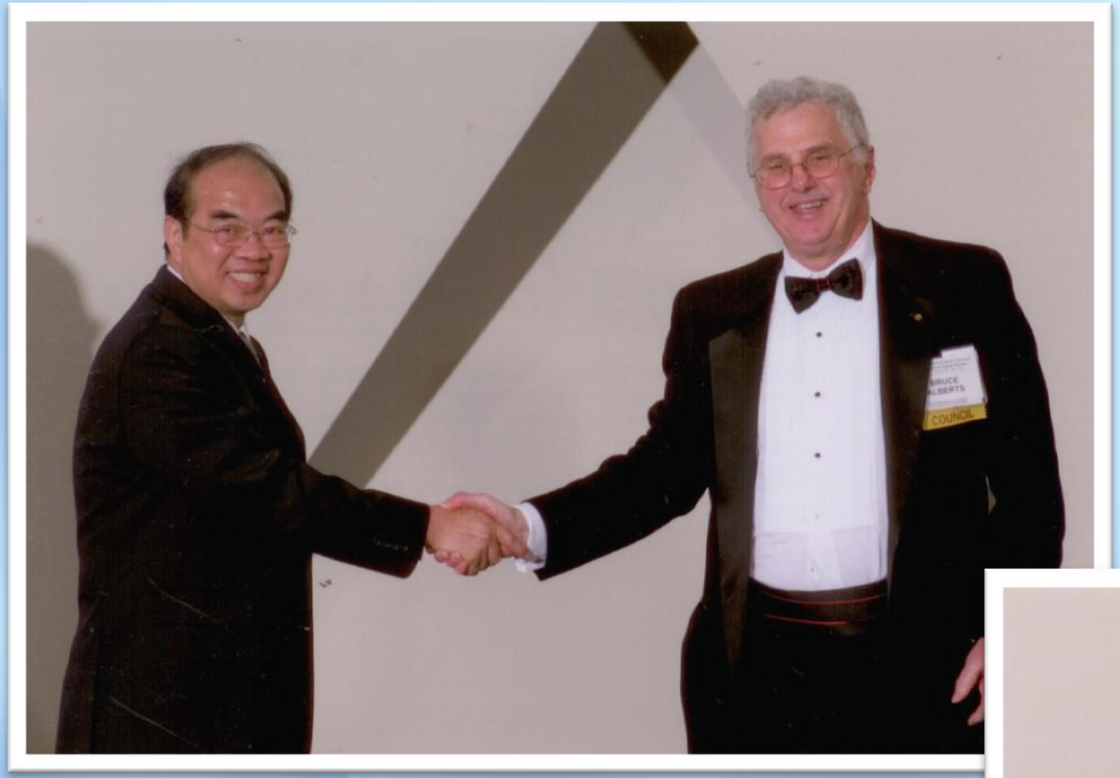
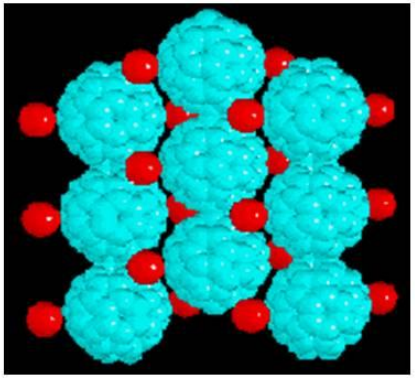


2004 年當選美國
國家科學院院士

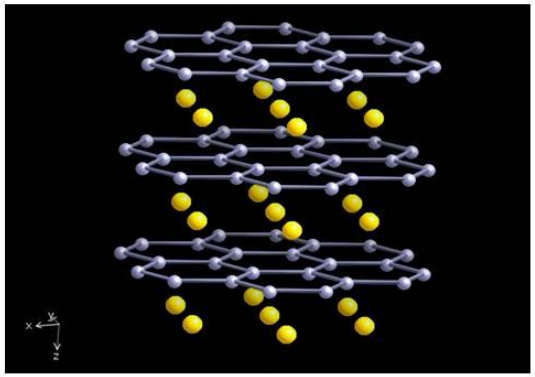
二、個人經驗分享(二)

The Best Accomplishments

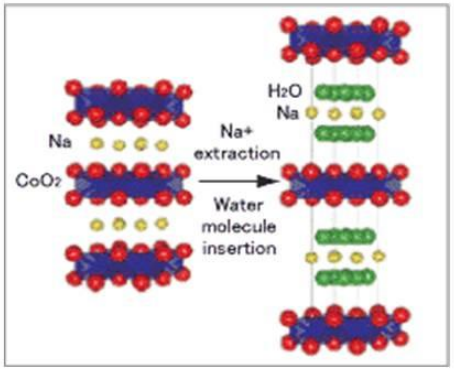
- *Triumph of Physicists, Chemists and Material Scientists*



Rb Dopded C_{60}



MgB_2



$Na_xCoO_2 \cdot yH_2O$

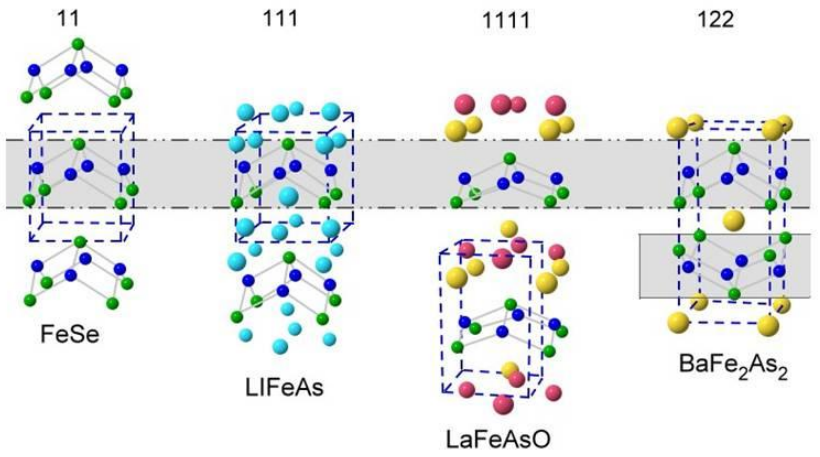
JACS COMMUNICATIONS

Published on Web 00/00/0000

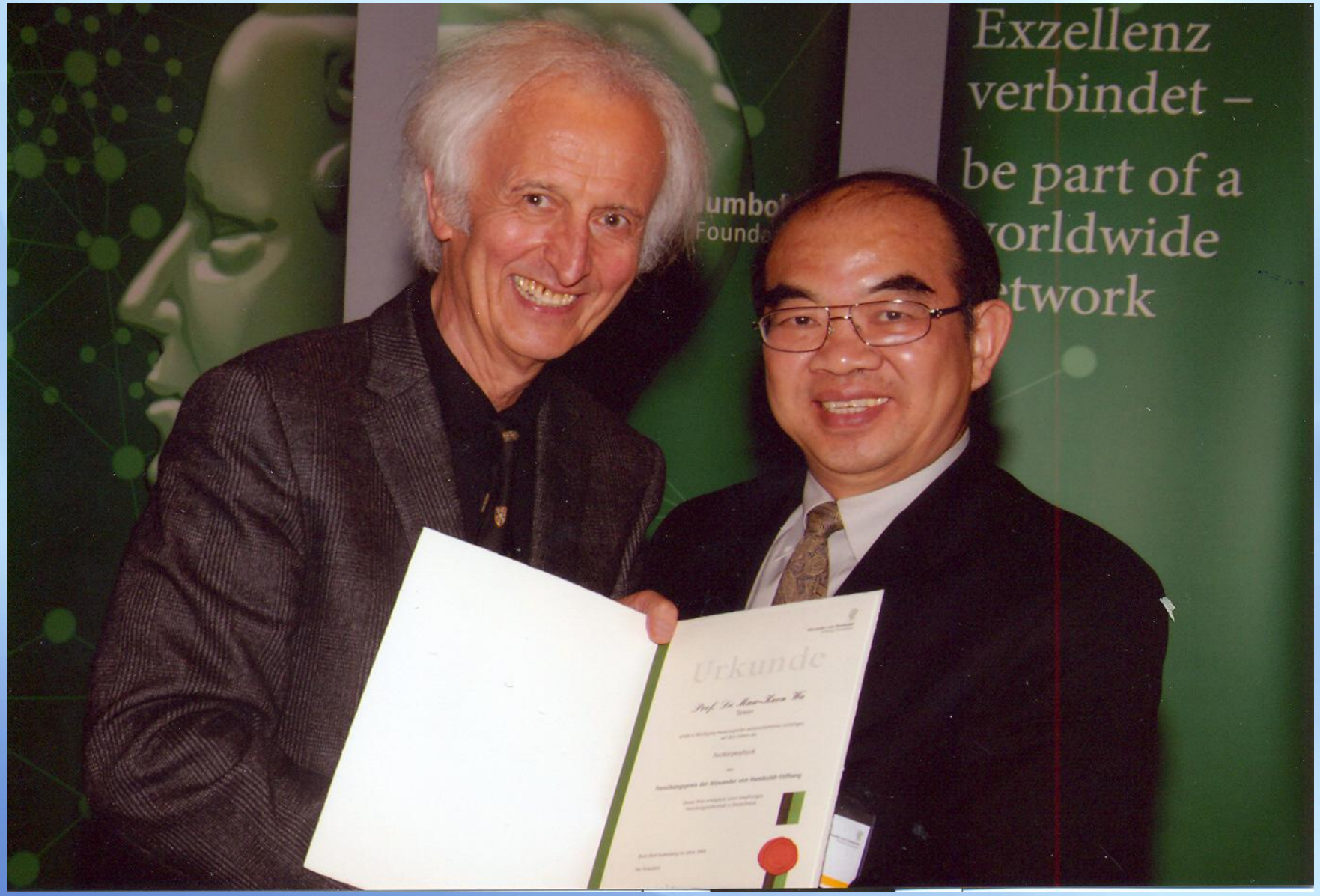
Iron-Based Layered Superconductor $La[O_{1-x}F_x]FeAs$ (x = 0.05–0.12) with T_c = 26 K

Yoichi Kamihara,*,† Takumi Watanabe,‡ Masahiro Hirano,†,§ and Hideo Hosono†,‡,§

ERATO-SORST, JST, Frontier Research Center, Tokyo Institute of Technology, Mail Box S2-13, Materials and Structures Laboratory, Tokyo Institute of Technology, Mail Box R3-1, and Frontier Research Center, Tokyo Institute of Technology, Mail Box S2-13, 4259 Nagatsuta, Midori-ku, Yokohama 226-8503, Japan



二、個人經驗分享(二)


Exzellenz
verbindet –
be part of a
worldwide
network
Urkunde

二、個人經驗分享(二)

二、個人經驗分享(二)

My inauguration was originally scheduled for January 22nd, 2012. January 22nd is Chinese New Year's Eve. The date holds a special meaning to me. On January 27th 1987 (which was the Chinese New Year's Eve that year), twenty-five years ago, we discovered the YBCO high temperature superconductor in my lab in Huntsville, Alabama.

二、個人經驗分享(二)

"The object of the educational system, taken as a whole, is not to produce hands for industry or to teach the young how to make a living. It is to produce responsible citizens"

Robert Maynard Hutchins, President
University of Chicago (1929 - 1951)

教育的目的，除了養成有能力建立美好生活之專業人士外，同時要培育對社會與產業有影響力的負責任公民。

二、個人經驗分享(二)

希望建構一所完全大學，培育有特色風範、有專業素養、能關懷並服務社會的東華人！

二、個人經驗分享(二)

- **完整的教育體系（大學、中、小學與幼教），提供實踐動教育理念與培育卓越人才的搖籃**
  - 培育具東華特質及專業能力的社會菁英
    - 確實推行“八正道”的全人教育
    - 訓練學生自主尋主問題、解決問題的能力
    - 養成學生創新能力及熱忱服務社會的態度
- **豐富的在地資源：地質與生物的多樣性，多元文化，樸實的風土民情，鄉親對東華的期許與支持**
  - 針對豐富的在的資源，加強學生能力並協助提升在地產業
    - 以學校專業能力協助地方政府進行長遠規劃
    - 協助強化優質在地產業，推展綠色經濟，創造價值
    - 規劃使花蓮成爲推展文化創意產業的基地

二、個人經驗分享(二)

優質化學習環境規畫

1. 建構多元化的教與學空間
2. 形塑文化藝術的學習環境
3. 規畫人性化生活休憩空間
4. 設置現代化科技資訊設備
5. 推動校園綠化美化公園化

二、個人經驗分享(二)

培養學生自主管理，提高社會競爭力

- 學生自治組織的創新與特色
  - 採取間接投票的內閣制
  - 外籍學生也有參與學生自治組織的權利
- 學校營造志工服務大學的氛圍
  - 落實服務在地化的精神
  - 介紹青輔會「關愛社區、享受學習」專案的特色
  - 各學院、各社團與服務學習課程投入國內外志工服務的情形
- 社團所進行的服務學習與志工參與都可以獲得通識教育的服務學習課程的學分與認證

二、個人經驗分享(二)

積極推動社會服務

- 將東華的教育資源提供予東華社群
  - 協助偏遠地區、弱勢族群教學
  - 與地區中、小學共同建構多語教育環境，培育特殊人才之教育體系
- 落實產學合作，協助東部地區產業發展:
  - 觀光產業，深層海水產業、海洋資源
  - 無毒有機農業、原住民，文化創意產業等
- 繼續推動「學術國際化，服務在地化」
  - 積極參與國內外學術活動
  - 鼓勵社區與在地企業參與，增加互動與交流，擴散研究能量，分享研究成果

二、個人經驗分享(二)

學/職/生涯輔導機制

- 學校專責機制的統合：學務處（畢輔組、生輔組、衛保組）、諮商中心、教卓中心（學輔組）等單位的統合
- 導師手冊的編制、導師增能的研習與訓練
- 生活導師、學業導師的設置
- 優良導師的表揚與獎勵、優良導師的傳承與經驗分享
- 學生選課預警制、實習課程的規劃與補助
- 結合學校資源，鼓勵舉辦創意導師生活動、舉辦就業講座與就業博覽會

二、個人經驗分享(二)

強化優質教師教學能力

- 讓教授變學生：和學生一起學習的東華老師
- 帶領學生進行社會參與及實務行動
- 回應學生的多元文化需求（不同族群、性別、性取向、階級、國籍）
- 每位老師每學年都找夥伴互相觀課一次，並進行討論。
- 鼓勵學生訪談老師，撰寫老師的教學故事，編印東華牽阮的手

Instruction may end in the classroom,

but teacher-student interaction ends only with life !

二、個人經驗分享(二)

與校友的連繫

- 應建立機制追蹤校友專業能力與社會需求的配合度
- 學校應對校友持續關懷與聯繫
- 學校應建立聯繫管道，追蹤校友生涯發展之情形
- 學校應建立機制邀請校友協助校務，例如招生，課程修訂等事務

二、個人經驗分享(二)

Einstein's view on Education

"Anyone who has never made a mistake has never tried anything new"; "Curiosity has its own reason for existing"

"Most teachers waste their time by asking questions which are intended to discover what a pupil does not know, whereas the true art of questioning has for its purpose to discover what the pupil knows or is capable of knowing"

"Never regard your study as a duty, but as the enviable opportunity to learn to know the liberating influence of beauty in the realm of the spirit for your own personal joy and to the profit of the community to which your later work belongs"

二、個人經驗分享(二)