나노 기술의 이해
(Understanding Nanotechnology)

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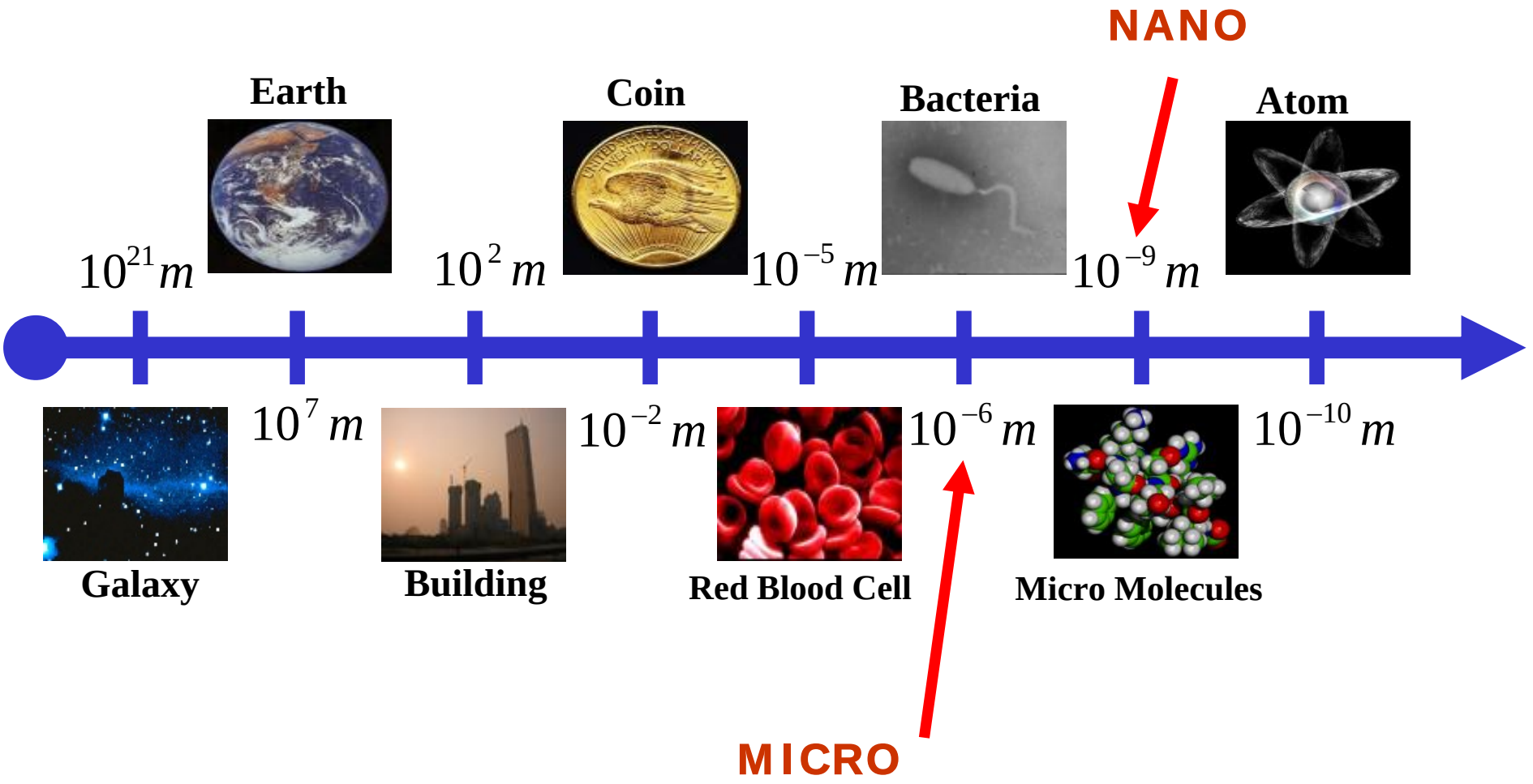
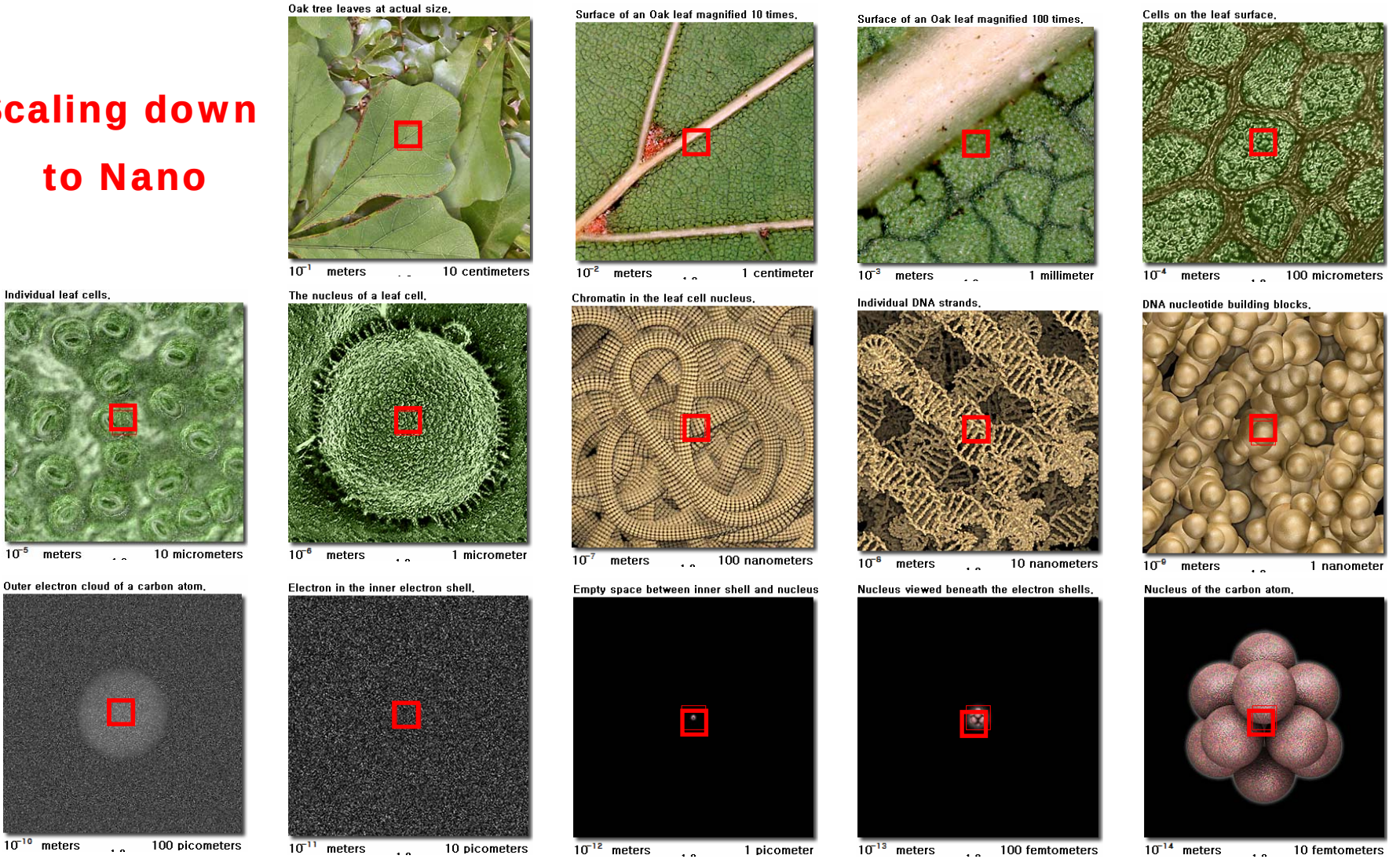
Lecture 1.
History of Nanotechnology

Nano? – Size of Nature



Nano?

Scaling down to Nano



Beginning of Nano

The Pioneer of Nano Technology

"There's plenty of room at the bottom"
Lecture given by Dr. Richard Feynman in 1959

What I want to talk about is the problem of manipulating and controlling things on a small scale.

It is a staggeringly small world that is below. In the year 2000, when they look back at this age, they will wonder why it was not until the year 1960 that anybody began seriously to move in this direction.

Why cannot we write the entire 24 volumes of the Encyclopedia Brittanica on the head of a pin?

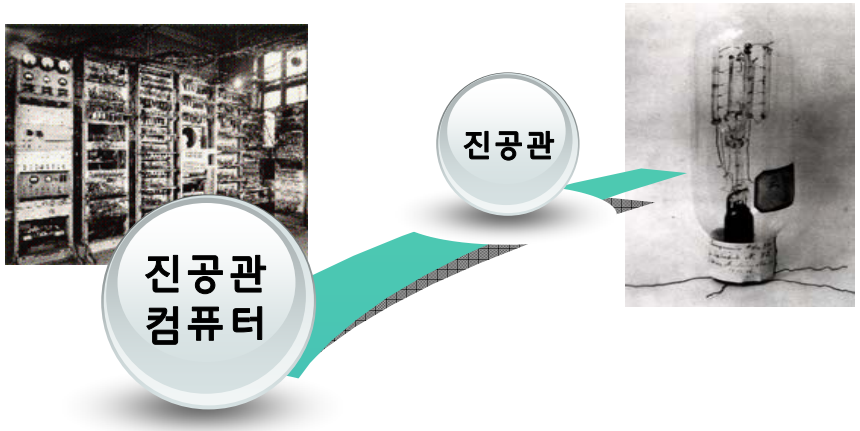
Beginning of Nano

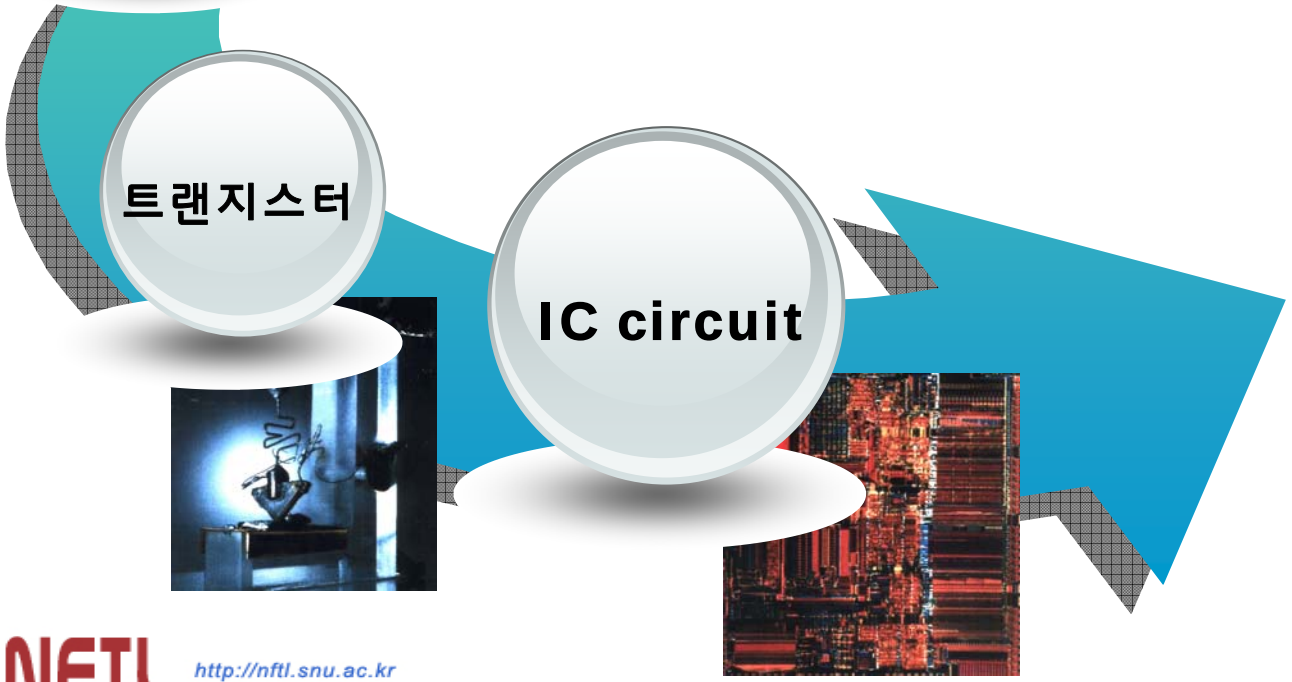
"Why cannot we write the entire 24 volumes of the Encyclopedia Britannica on the head of a pin?"

- Richard P. Feynman (1959)

Is it possible?

Why Nano? – Advancement of Modern technology



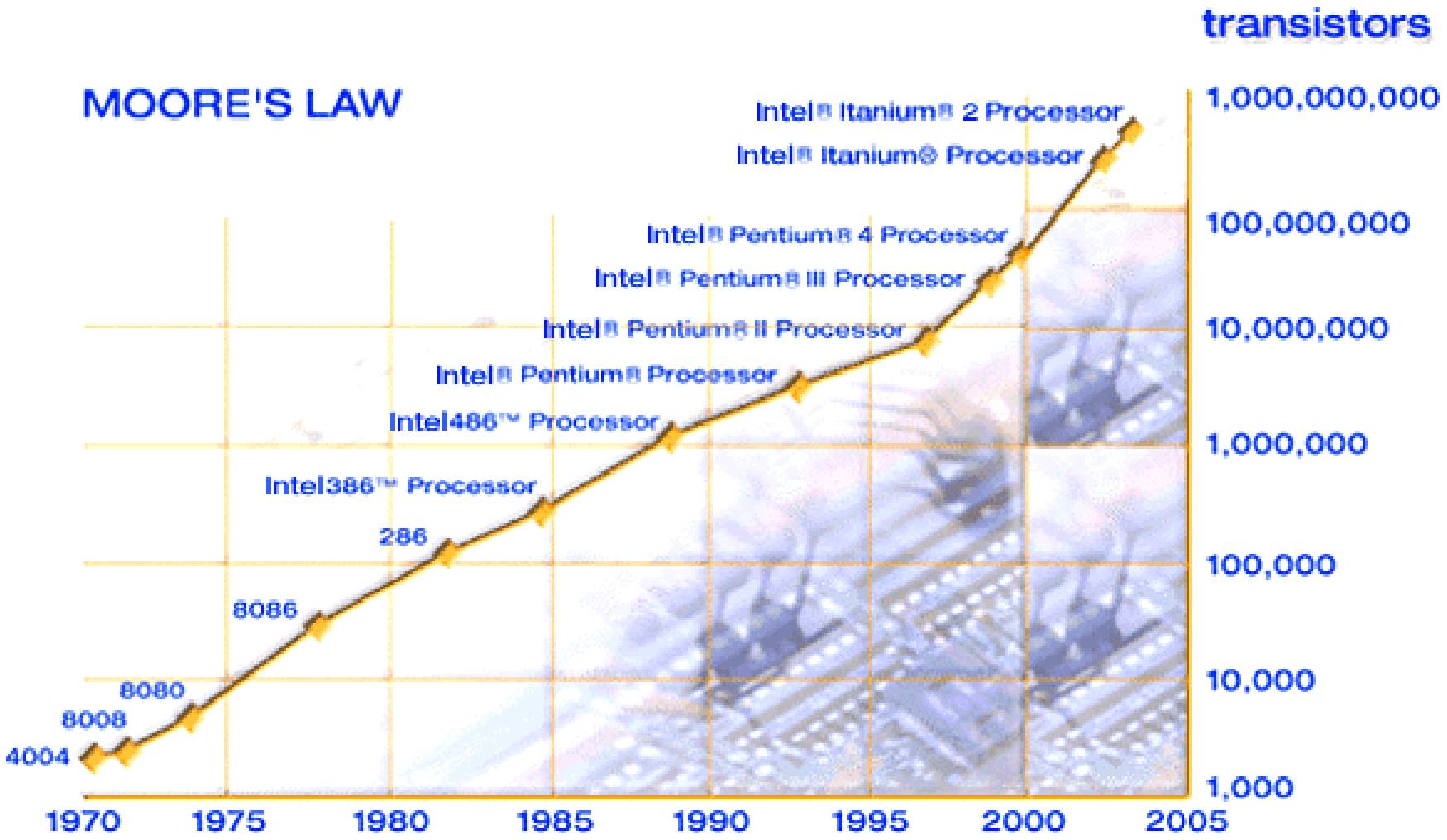


크기는 1억 배 감소 !

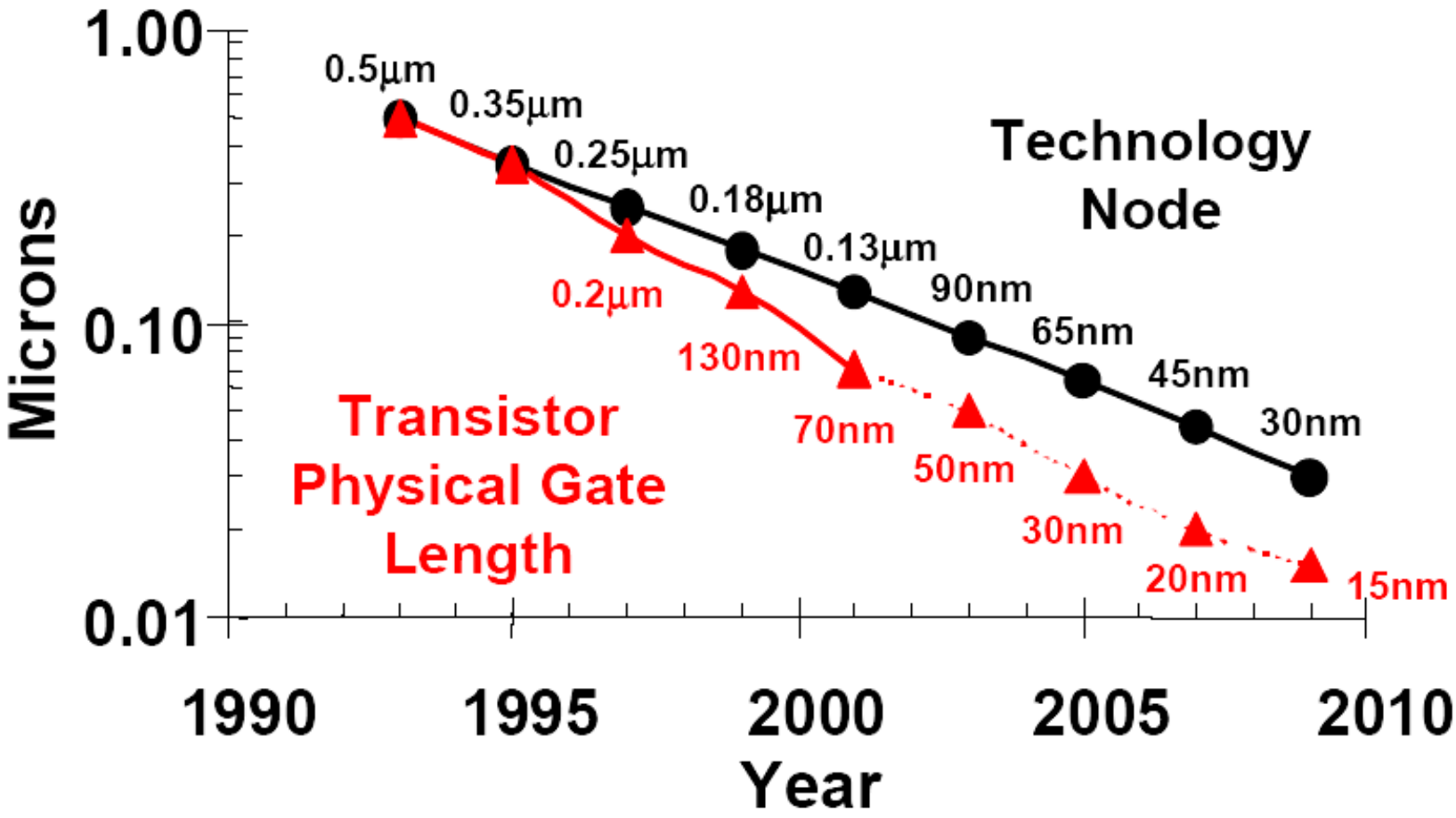
성능은 1억 배 향상 !

P4 notebook

Why Nano? – Moore's Law



Why Nano? - Transistor physical gate length trend



http://www.pentium.co.kr/research/silicon/micron.htm
G. Marcvk, R. Chau "New Transistor for 2005 and Beyond"

Investment to Nanotechnology - 클린턴의 연두교서

"My budget supports a major new National Nanotechnology Initiative, worth $500 million.... the ability to manipulate matter at the atomic and molecular level. Imagine the possibilities: materials with ten times the strength of steel and only a small fraction of the weight -- shrinking all the information housed at the Library of Congress into a device the size of a sugar cube -- detecting cancerous tumors when they are only a few cells in size. Some of our research goals may take 20 or more years to achieve, but that is precisely why there is an important role for the federal government."

--President William J. Clinton

January 21, 2000

California Institute Of Technology

- 원자, 분자 수준을 다룰 수 있는 기술 계발을 목표로 함.
- 5억불에 이르는 재원을 투입
- NNI (Nat'l Nanotech. Initiative) 계획 착수 및 나노기술발전위원회 설치

Investment to Nanotechnology - NNI 추진 대 과제

- **나노 소자** : 펜티엄 4 컴퓨터 보다 100만 배 성능 향상
- **초고밀도 메모리**

  : 미 국회도서관의 모든 장서를 각설탕 크기 메모리에 저장 가능
- **초고감도 생체센서** : 몇 개 단위의 암세포까지 검출
- **재료** : 철강보다 가볍고 10배의 강도를 가지는 재료
- **자기 조립기술**

  : 생명체의 생성과 같이 원자, 분자 단위로부터 출발하여 제품 제조
- **태양전지** : 현재의 2배 이상의 태양에너지 변환 효율

Investment to Nanotechnology - 나노 과학 기술 예산 (Dr. Roco, 미국 NSF)

Estimated Government sponsored R&D in $ millions/year

	1997	1998	1999	2000	2001	2002	2003
W. Europe	126	151	179	200	est.225	400	
Japan	120	135	157	245	410+140*	650	
USA	116	190	255	270	422	604	(710)
Others	70	83	96	110	est.380	~500	
Total	*432*	*559*	*687*	*825*	*1,577*	2,154	

W. Europe : EU and Switzerland

Others : Australia, Canada, China, FSU, Korea, Singapore, Taiwan and other countries

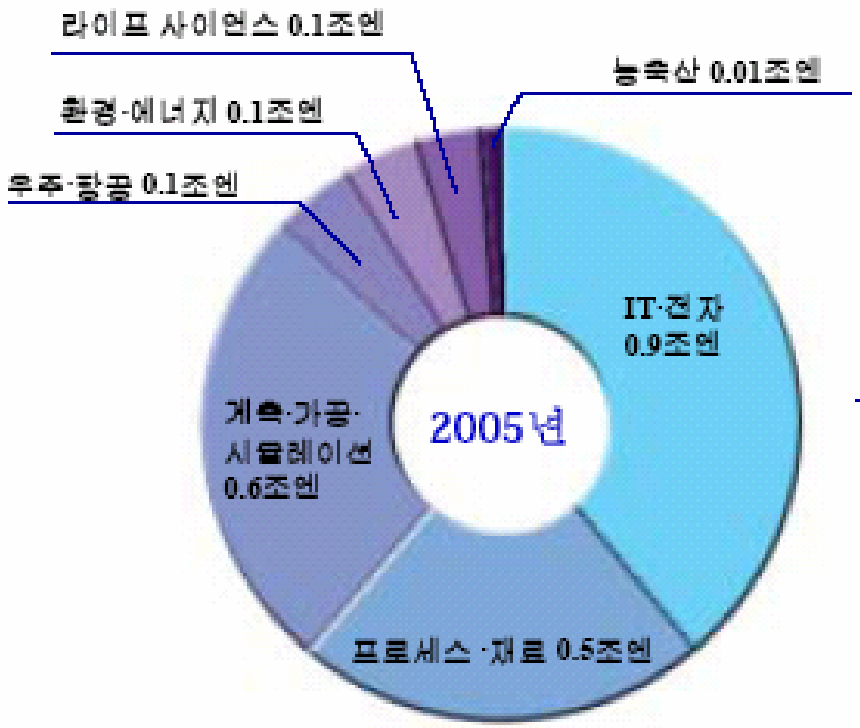
* supplement its initial $410 million NT investment in Japan

나노기술이 5년 뒤 세상을 바꿀 10대 기술

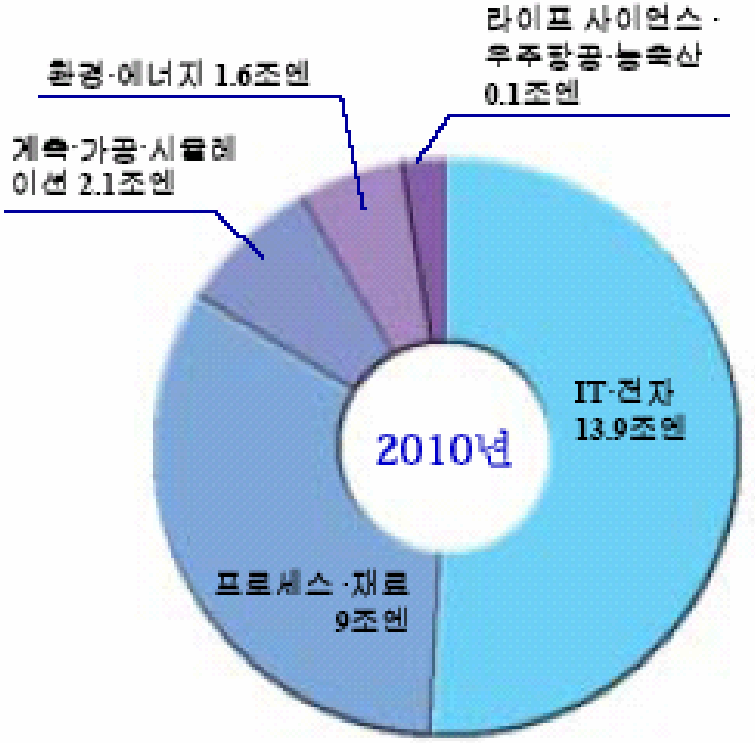
- 초고속 무선 인터넷
- 유비쿼터스 컴퓨팅
- 차세대 디스플레이
- 나노전자소자
- 생명복제
- 신약 디자인
- 시스템-온-칩
- 차세대 정보 보호 기술
- 바이오칩
- 연료전지

* 동아시아 사이언스 선정, 2003

Rising of Nanotechnology - 일본의 NT 시장 규모 전망



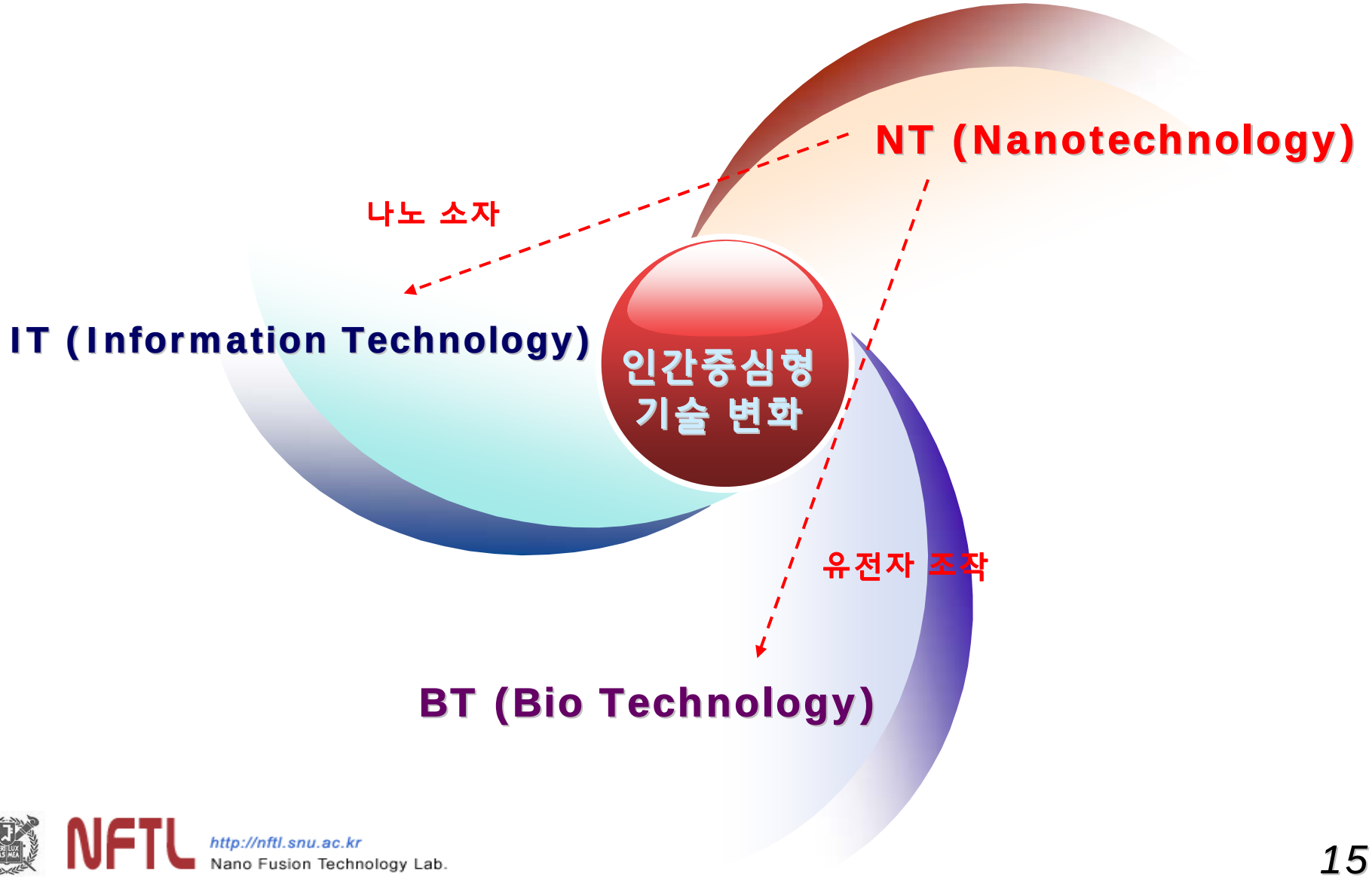
● 총 시장 규모 : 2.4조엔



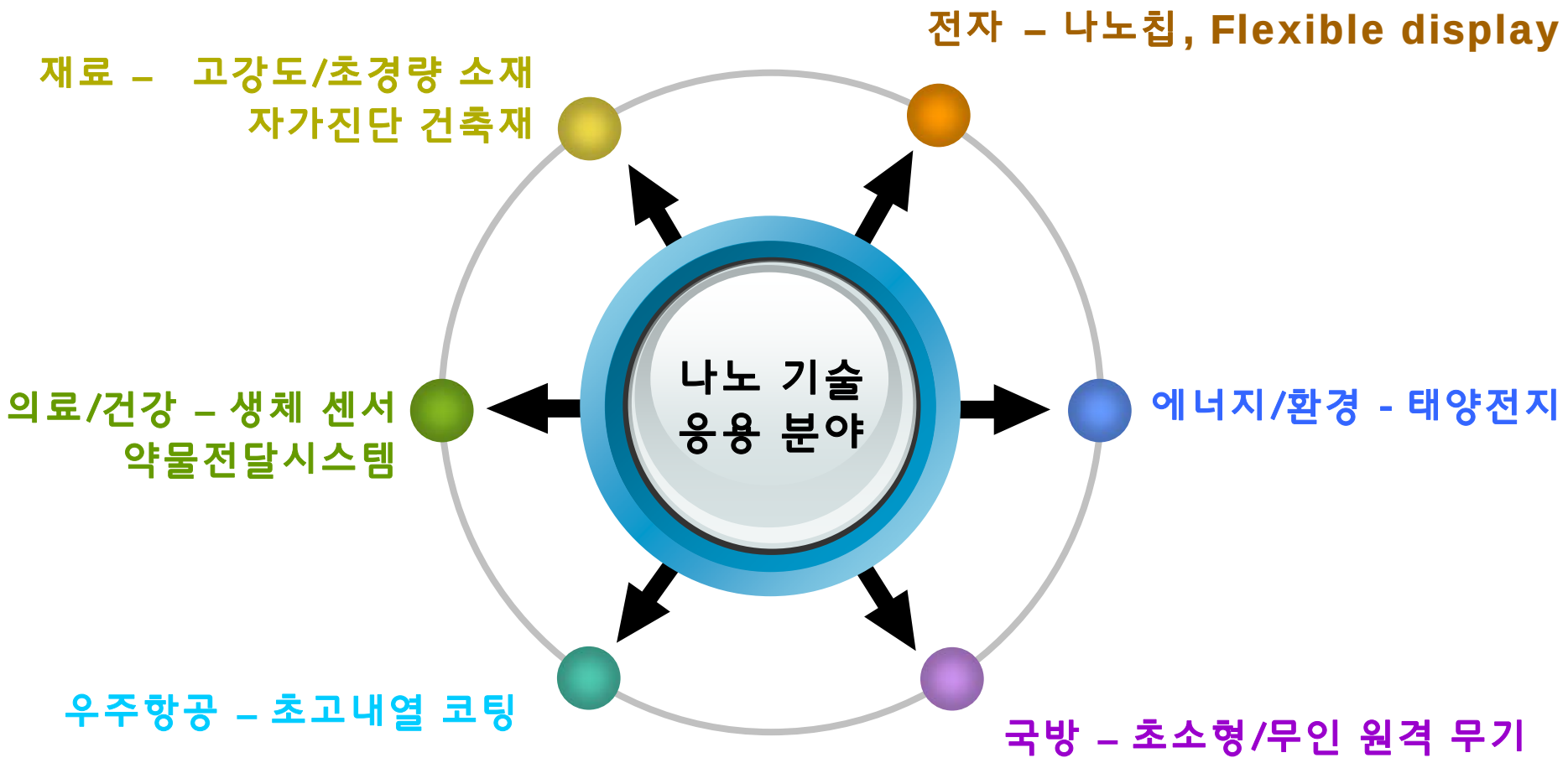
● 총 시장 규모 : 27.3조엔

자료 : 히타치 종합 연구소

No Doubt… Here comes the Nanotechnology - 21세기 3 대 기술혁명



No Doubt… Here comes the Nanotechnology - 나노 기술 응용 분야



No Doubt... Here comes the Nanotechnology - 나노 기술 이해의 필요성

나노 기술은 21세기 과학 기술의 새로운 패러다임

Sketch your mind-map through this semester