

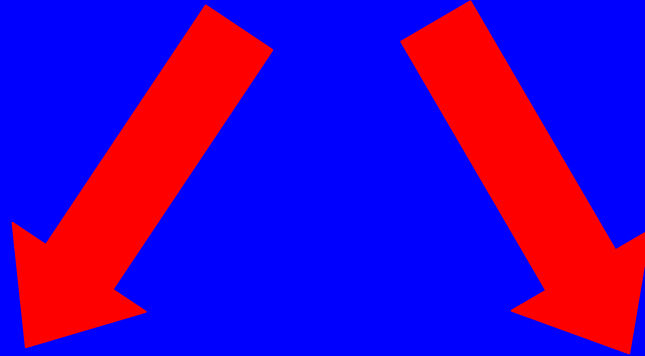
ΧΗΜΙΚΗ ΤΕΧΝΟΛΟΓΙΑ-ΝΑΝΟΤΕΧΝΟΛΟΓΙΑ



Πανεπιστήμιο Κρήτης-Τμήμα Χημείας

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ΧΗΜΙΚΗ ΤΕΧΝΟΛΟΓΙΑ-ΝΑΝΟΤΕΧΝΟΛΟΓΙΑ



ΧΗΜΙΚΗ ΤΕΧΝΟΛΟΓΙΑ

**ΕΦΑΡΜΟΓΕΣ ΤΗΣ ΧΗΜΕΙΑΣ
ΣΤΗ ΒΙΟΜΗΧΑΝΙΑ,
ΧΗΜΙΚΗ ΜΗΧΑΝΙΚΗ**

ΝΑΝΟΤΕΧΝΟΛΟΓΙΑ

**ΝΑΝΟΧΗΜΕΙΑ, ΝΑΝΟΚΛΙΜΑΚΑ,
ΝΑΝΟ, ΝΑΝΟ, ΝΑΝΟ,.....**

NANOXHMEIA

What is Nanochemistry?

With nanoscience being the discipline concerned with making, manipulating and imaging materials having at least one spatial dimension in the size range 1–1000 nm and nanotechnology being a device or machine, product or process, based upon individual or multiple integrated nanoscale components, then what is nanochemistry? In its broadest terms, the defining feature of nanochemistry is the utilization of synthetic chemistry to make nanoscale building blocks of different size and shape, composition and surface structure, charge and functionality. These building blocks may be useful in their own right. Or in a self-assembly construction process, spontaneous, directed by templates or guided by chemically or lithographically defined surface patterns, they may form architectures that perform an intelligent function and portend a particular use.

Nanotechnology And Chemistry

Traditional chemistry: molecules and reactions. This is nanoscale. What is new in nanoscience?

Traditional chemistry: mix plenty molecules A with plenty of molecules B and receive plenty of molecules C.

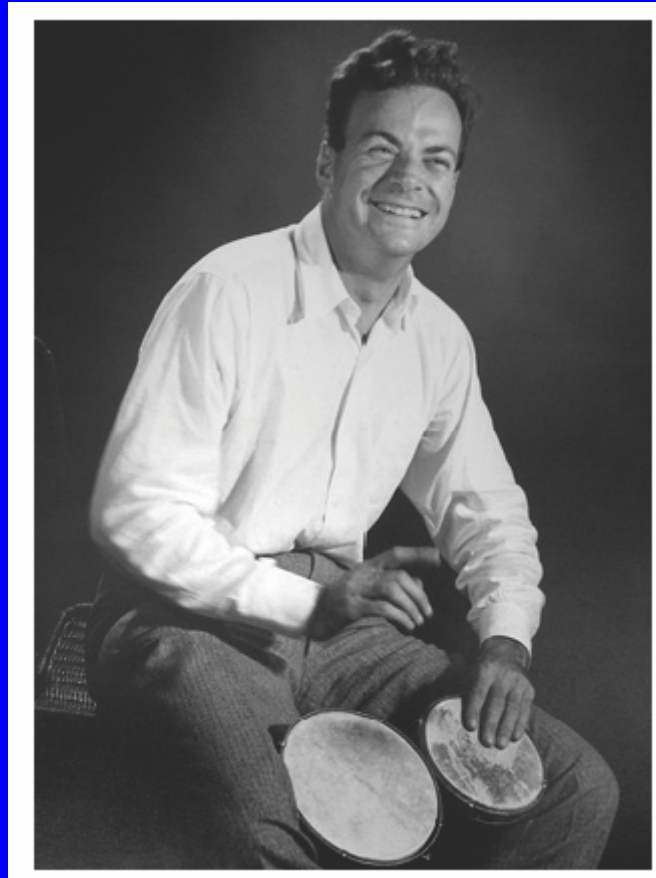
- Low yield: only some A will react with some of B. Low sensitivity.
- Long time: we wait for A to collide with B.

Biological systems are quite different:

- Very high sensitivity. Example: olfactory sense. We can smell a skunk (crotyl mercaptan) when the concentration is $2.9 \cdot 10^{-5}$ parts per million. This means just several hundred molecules in the olfactory sensors (and dogs can do much better)!
- Rather high reaction times: we smell a skunk very fast!

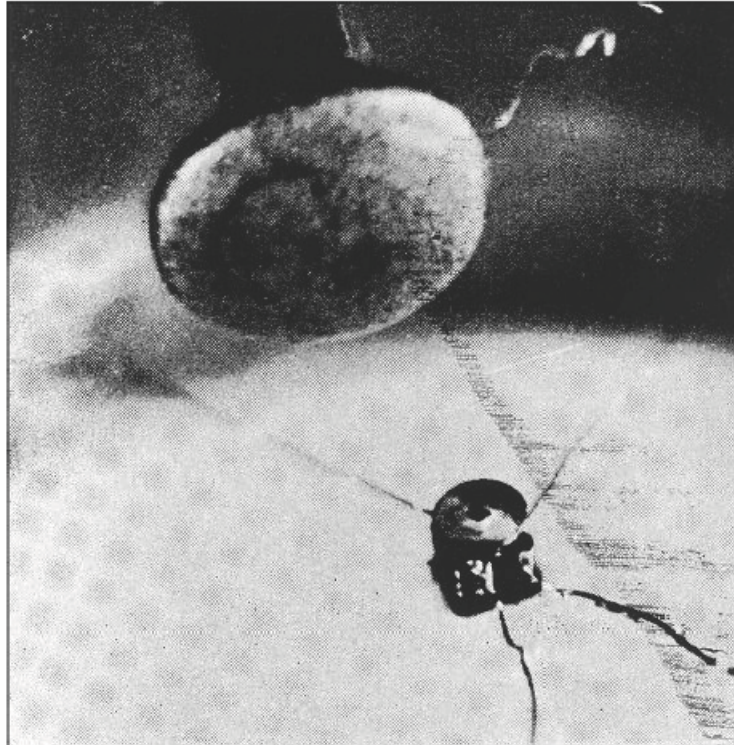
Nanoscale chemistry: we want to have high yield, high sensitivity, high reaction times.

RICHARD FEYNMANN: Ο «ΠΡΟΦΗΤΗΣ» ΤΟΥ ΝΑΝΟ...

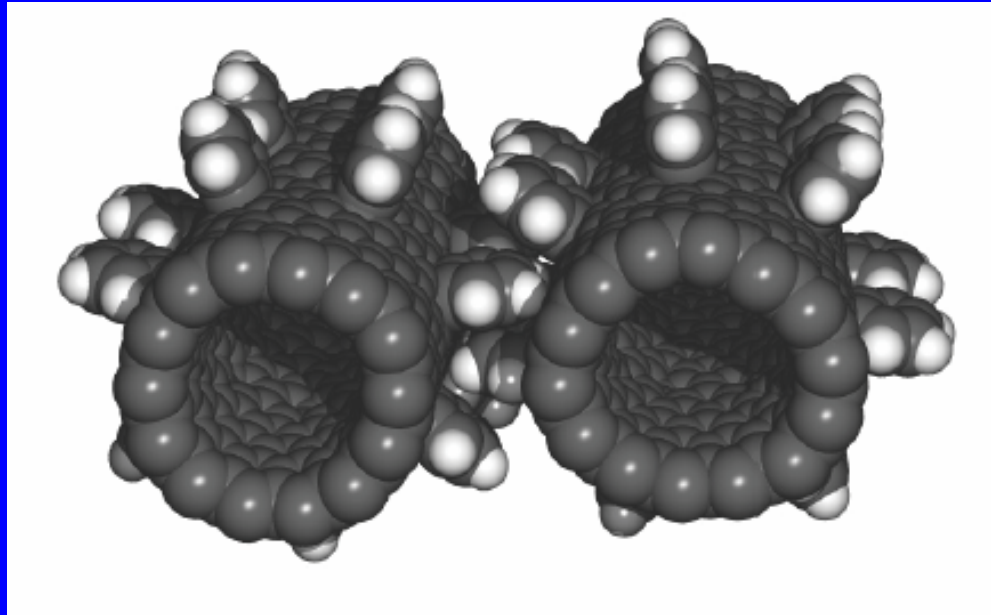


Ο ΠΡΩΤΟΣ ΑΝΕΜΙΣΤΗΡΑΣ ΚΕΦΑΛΙΟΥ ΚΑΡΦΙΤΣΑΣ

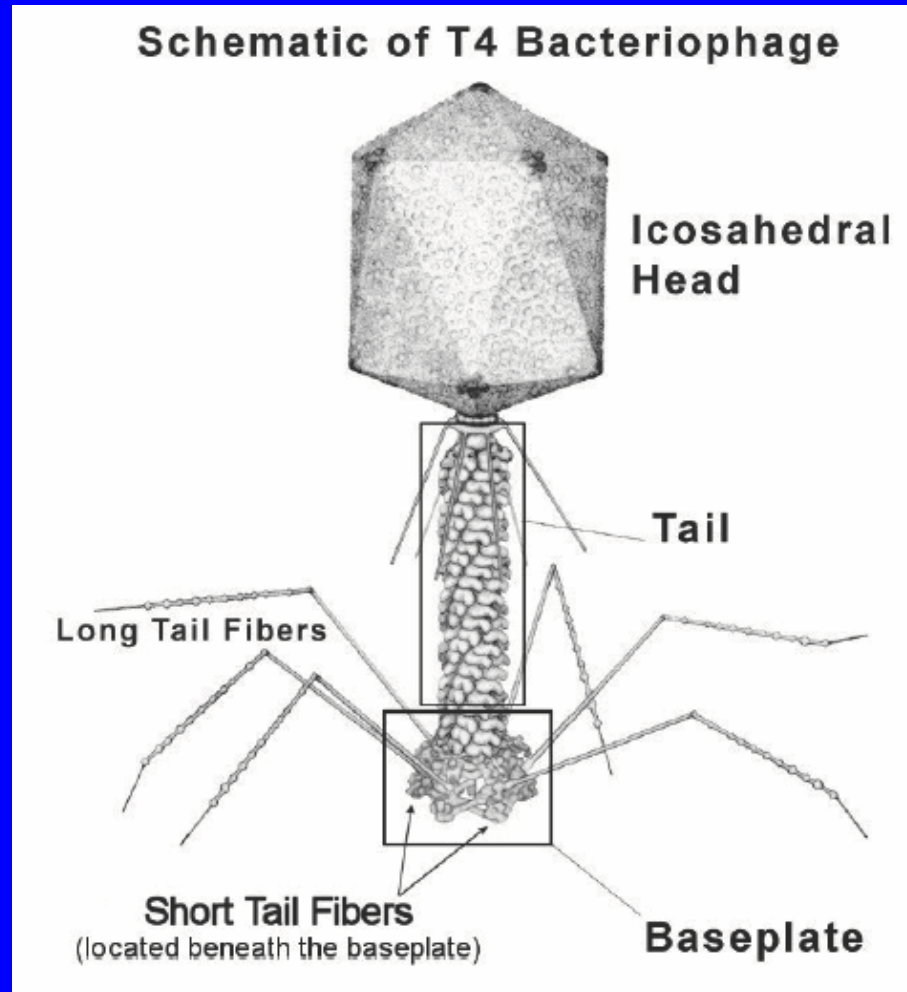
Feynman prize, 1960: 1/64" motor (McLellan):



NANOΓΡΑΝΑΖΙΑ



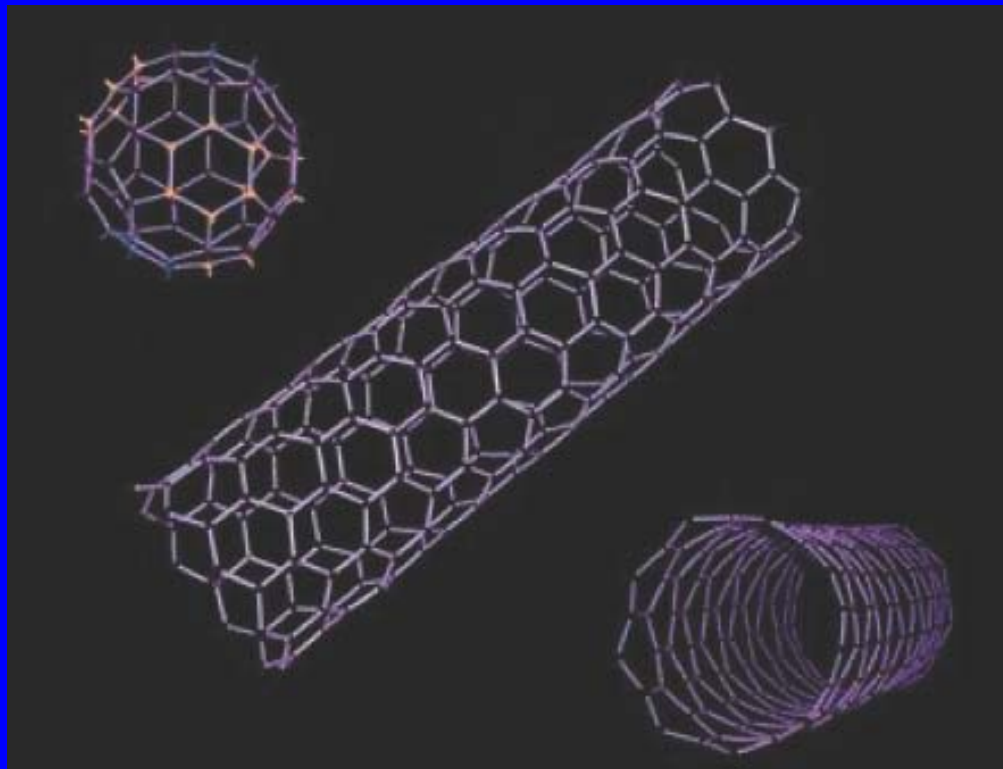
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ΝΑΝΟΜΗΧΑΝΕΣ: ΠΡΟΠΕΛΕΣ

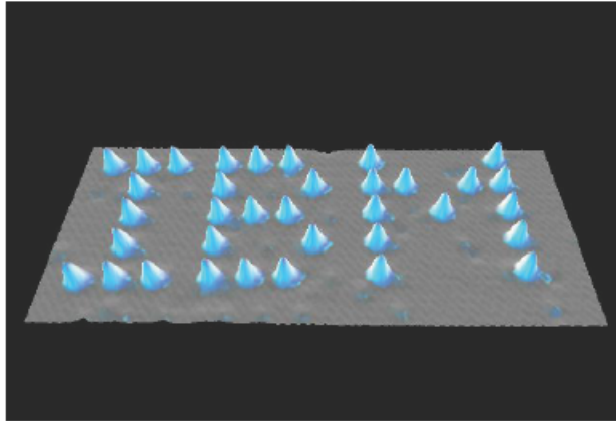


ΝΑΝΟΣΩΛΗΝΕΣ ΑΝΘΡΑΚΑ

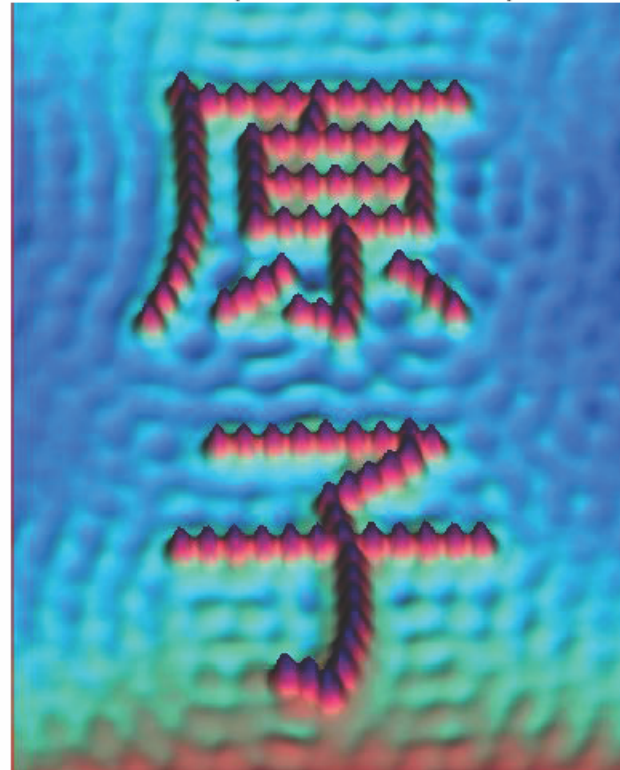


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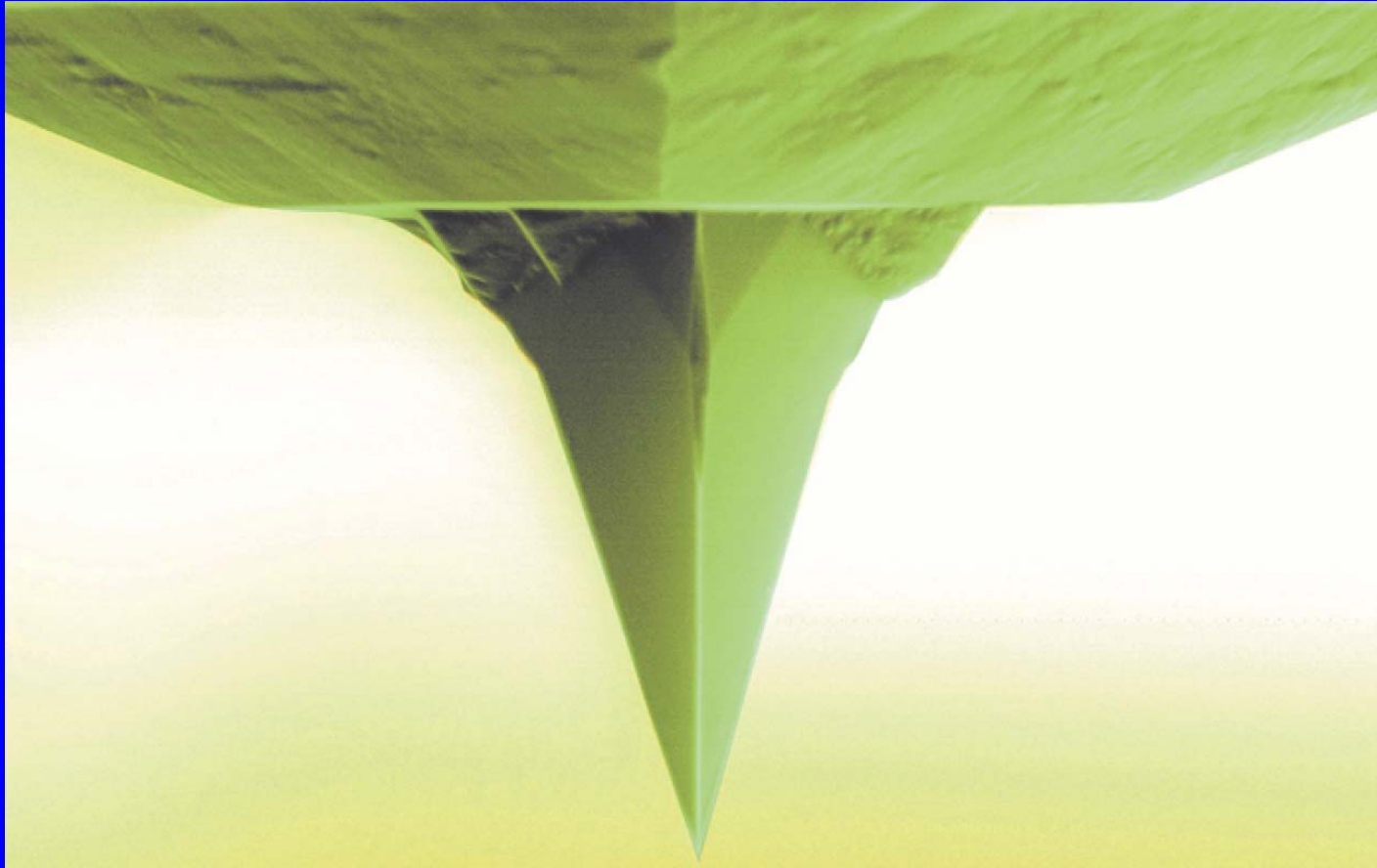
Famous IBM logo (Xenon on Nickel, 1990)



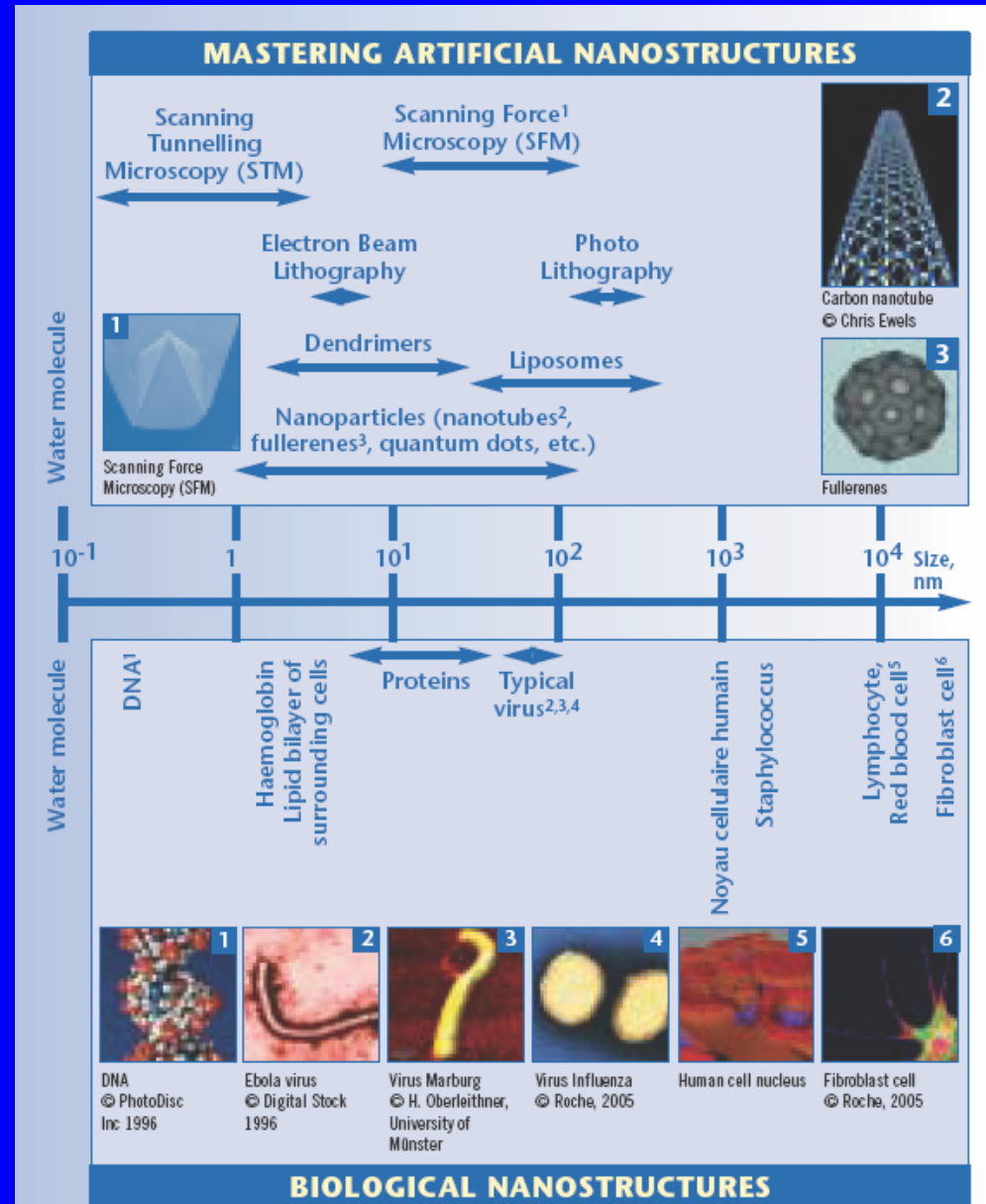
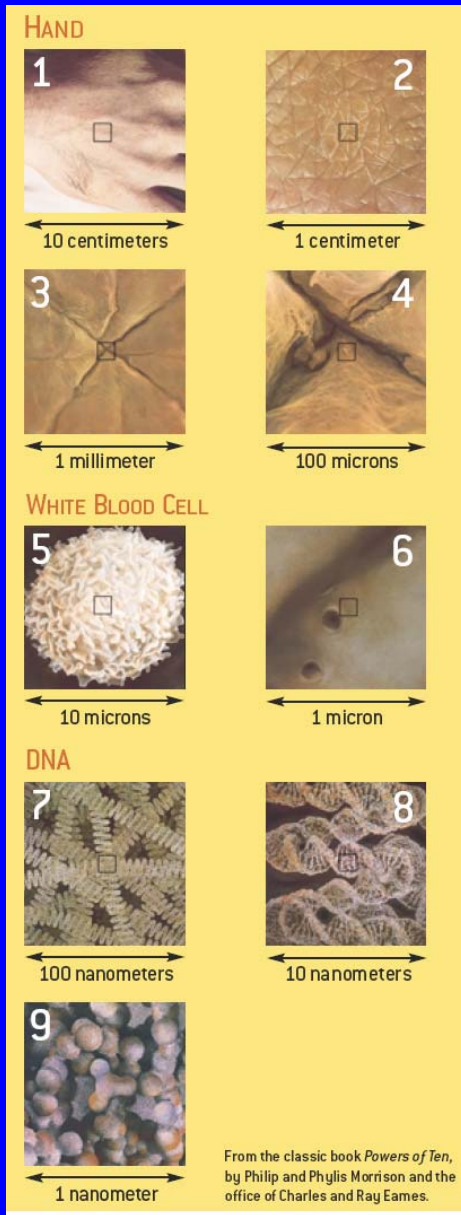
Atom (Iron on Copper)



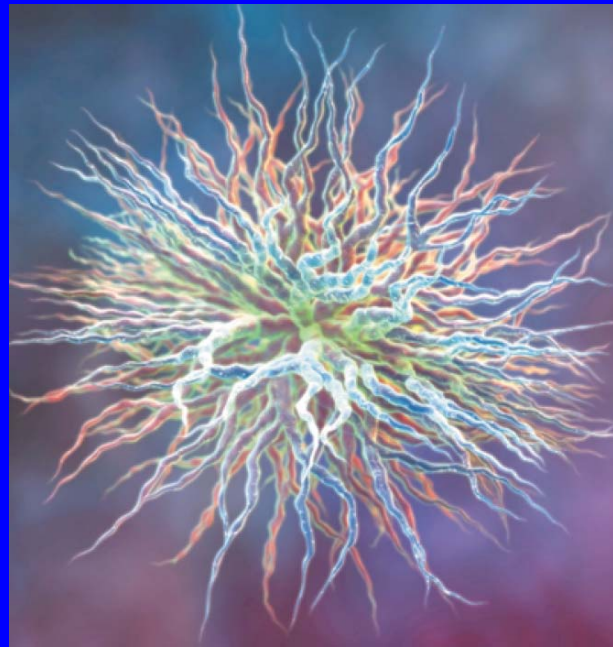
Η ΚΕΦΑΛΗ ΕΝΟΣ ΜΙΚΡΟΣΚΟΠΙΟΥ ΑΤΟΜΙΚΗΣ ΚΑΤΕΦΕΡΣ ΜΙΚΡΟΣΚΟΠΙΑΣ (AFM)



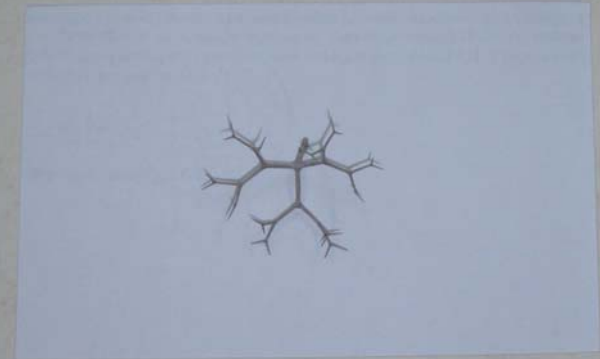
Η ΚΛΙΜΑΚΑ ΤΟΥ NANO: ΠΑΡΑΔΕΙΓΜΑΤΑ



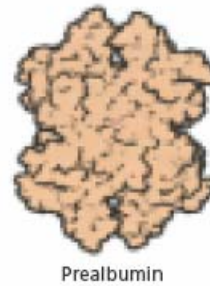
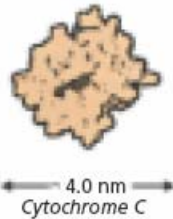
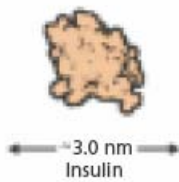
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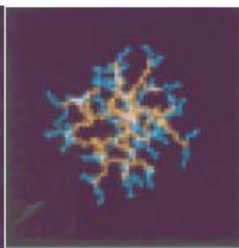
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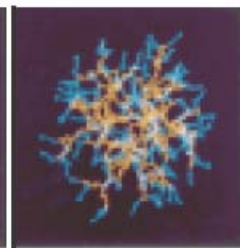
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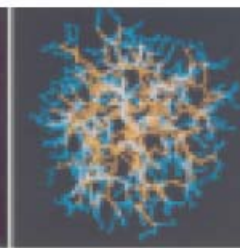
3.1 nm
G = 3.0



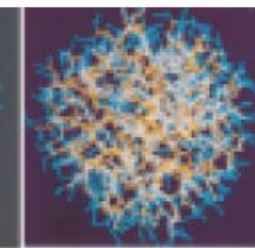
4.0 nm
G = 4.0



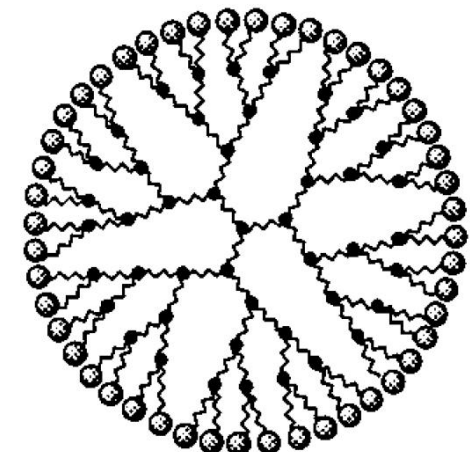
5.3 nm
G = 5.0



6.7 nm
G = 6.0

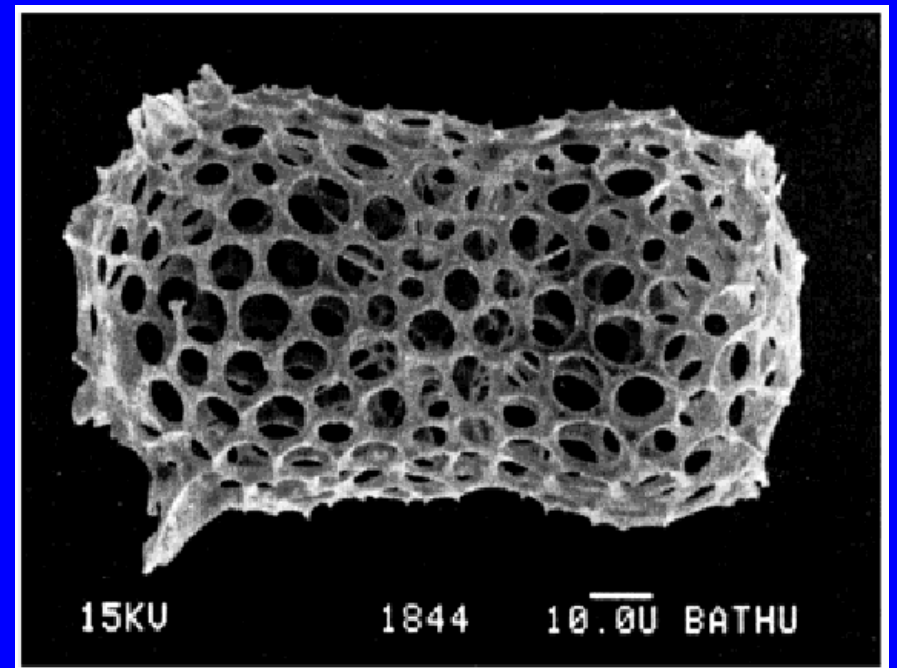
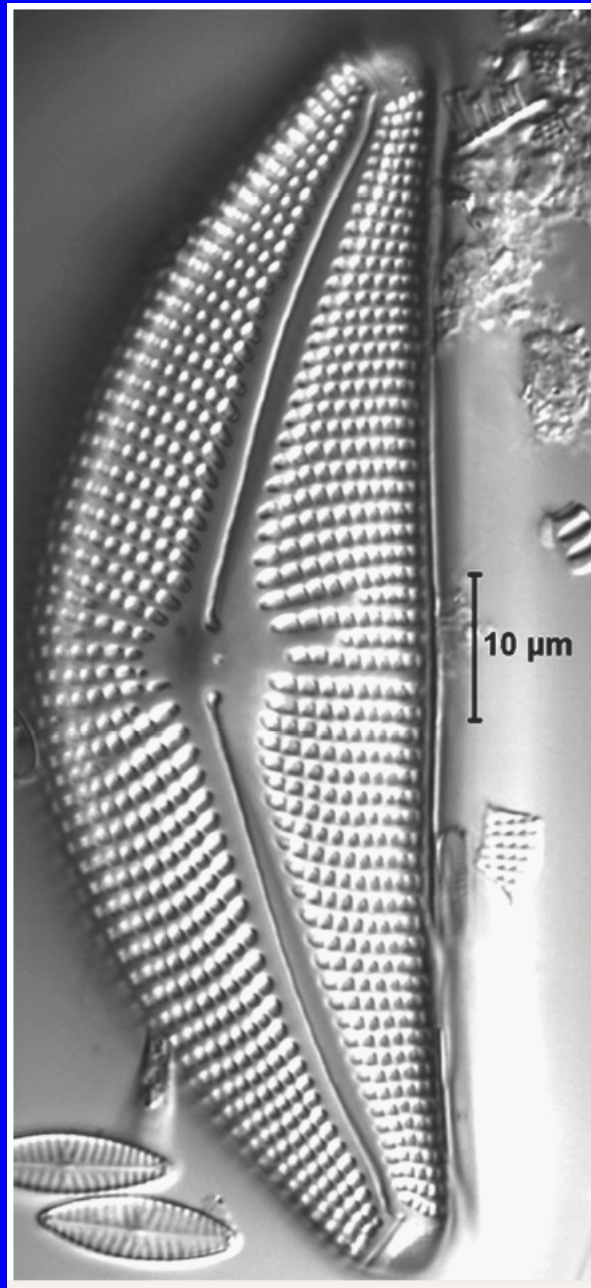


8.0 nm
G = 7.0



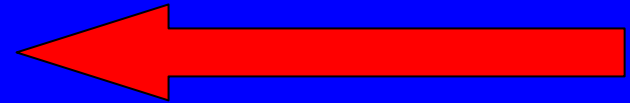
Dendrimer

Siliceous diatom

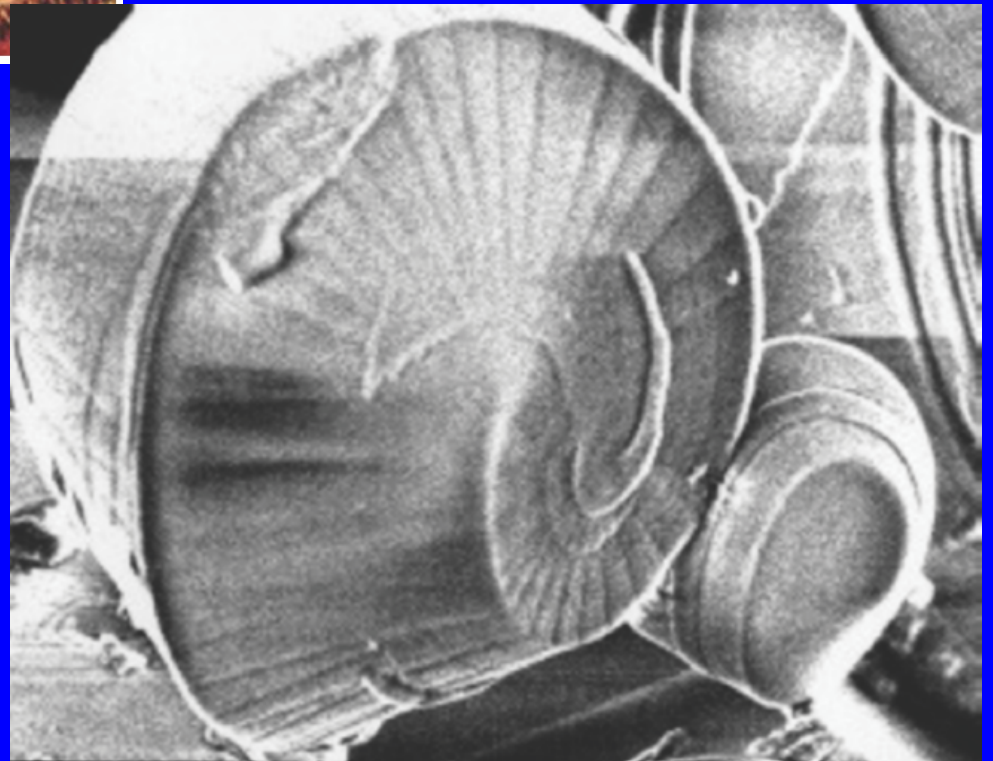
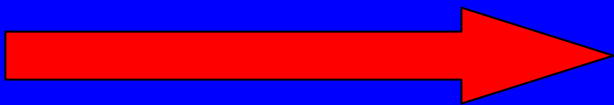




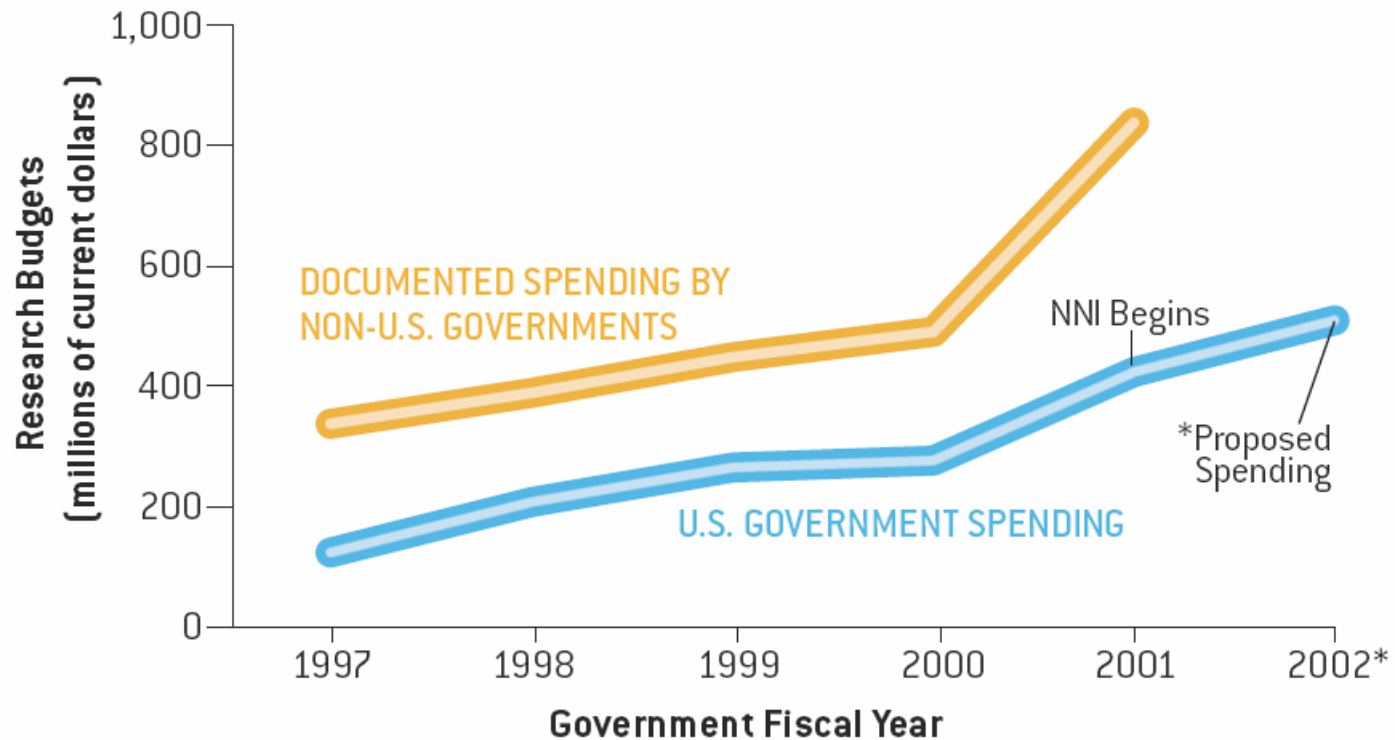
«ΦΥΣΙΚΑ» ΚΟΧΥΛΙΑ



«ΤΕΧΝΗΤΑ» ΚΟΧΥΛΙΑ

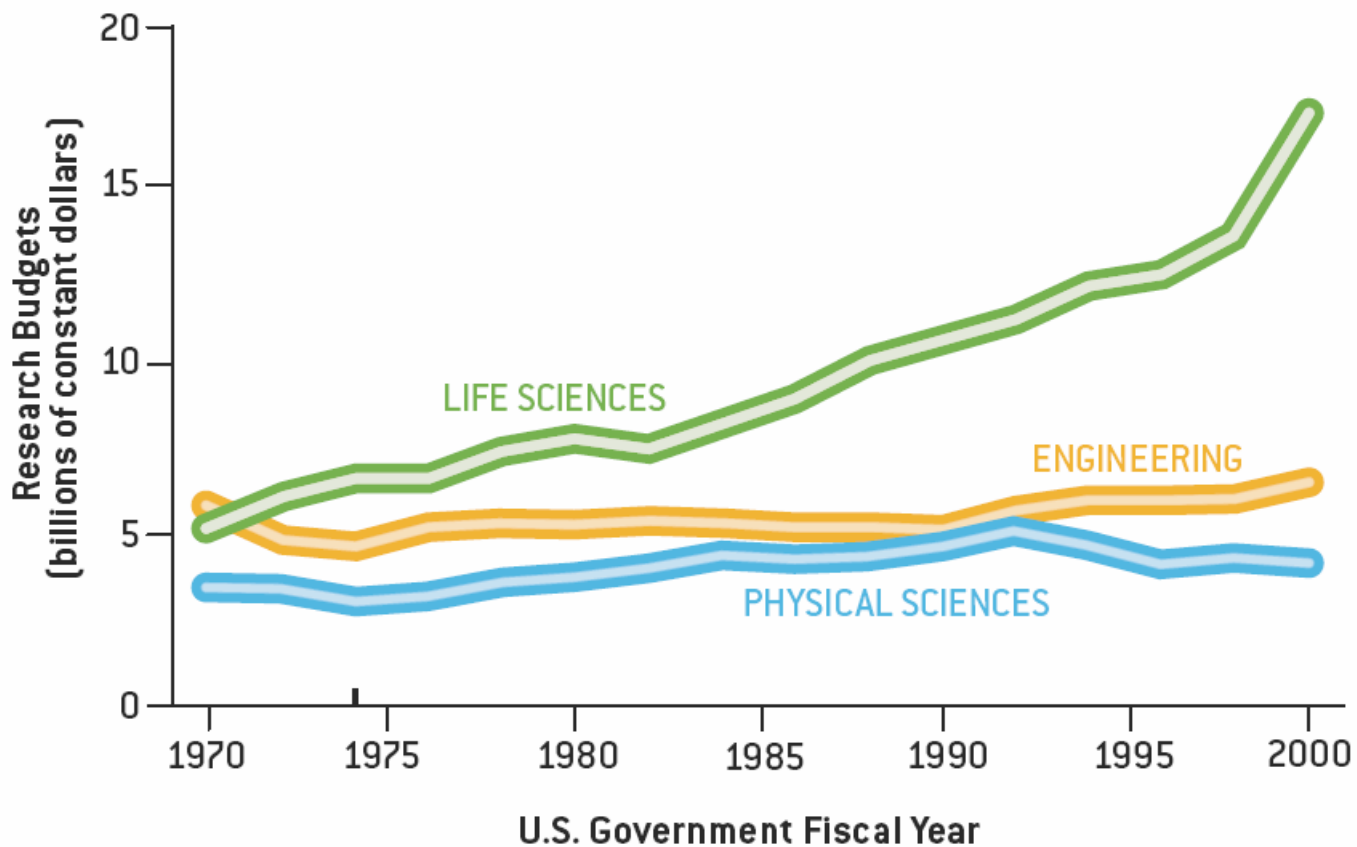


FUNDING FOR NANOTECHNOLOGY



SOURCES: U.S. Senate briefing on nanotechnology, May 24, 2001, and National Science Foundation

TRENDS IN FEDERAL RESEARCH FOR SELECTED DISCIPLINES



SOURCE: National Science Foundation



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