OBSTACLES IN THE MODERN DEVELOPMENT OF NANOTECHOLOGIES and economic problems

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- **The problems of separate transistor.**
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- **New physical effects.**
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Development of »bucky paper« for the use as artificial muscles

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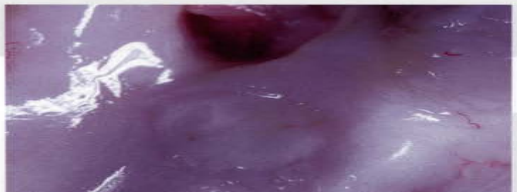
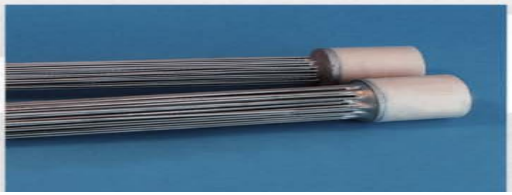
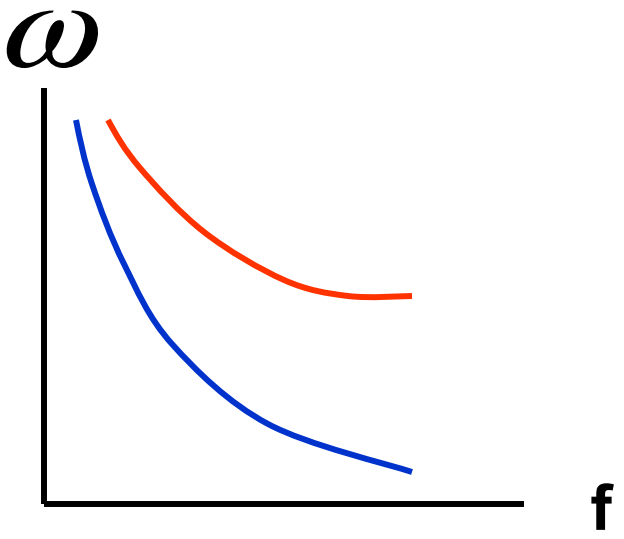




Flicker-noise (1/f) in nanotransistor



In the nano-size devices the abnormal level of the law-frequency noise with unexpected frequency dependence was observed

According to the engineers at the National Institute of Standards and Technology (NIST) who discovered the problem, it will soon stand in the way of creating more efficient, lower-powered devices like cell phones, laptops and pacemakers unless we solve it.

Measurements in Calabria University

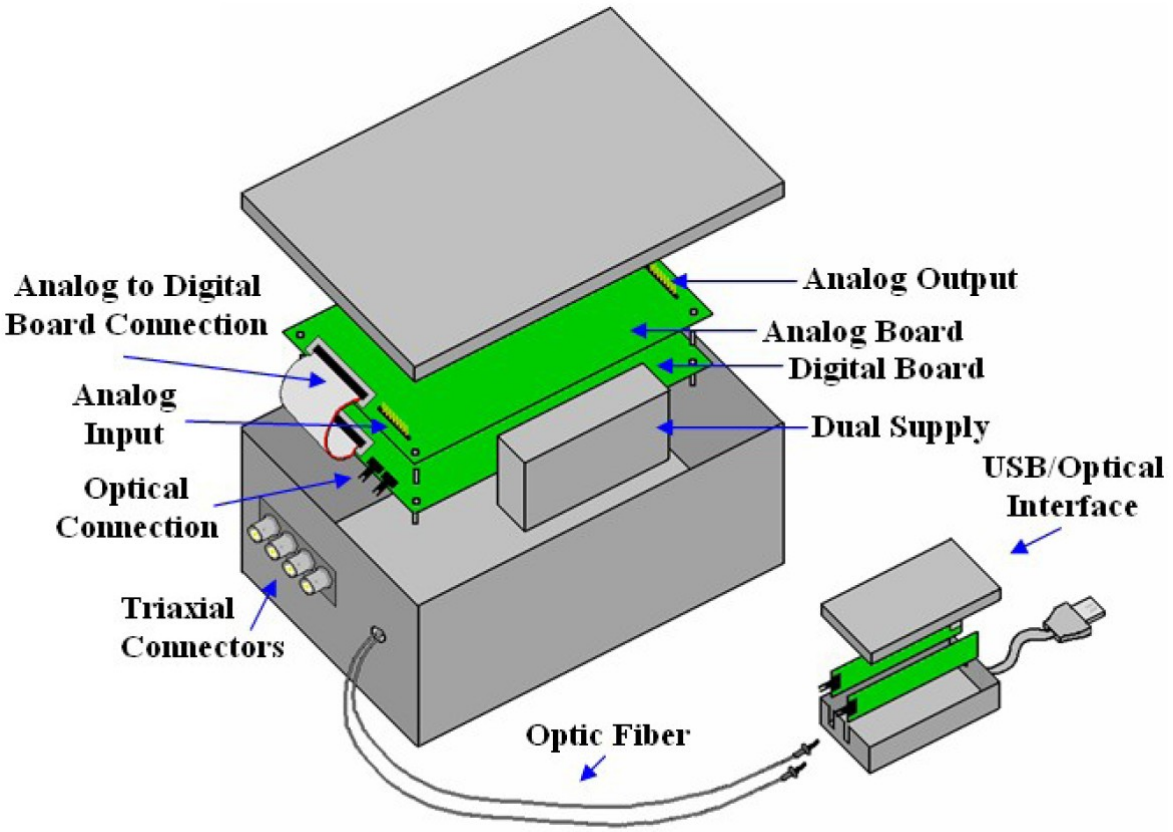


Figure 2 – Low Noise Programmable Measurement System.

The question is how to overcome this obstacle

Typical features of nanostructures:

- *A large part of week and excited chemical bonds;*
- *A high sensitivity to structural imperfections including radiation defects;*
- *A significant role of tunneling;*
- *Specific features of electronic and phonon spectra.*

First, scaling down physical objects we came to principal limits in the further movement in science.

Now we came to principal limits in technology!

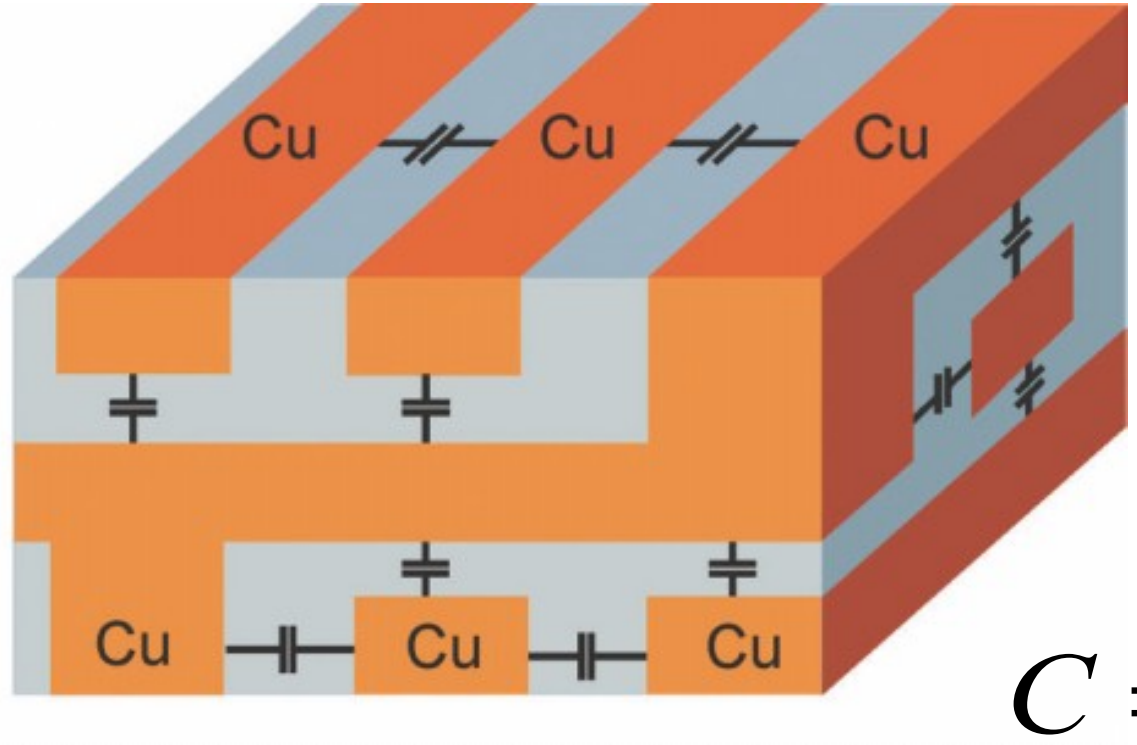
Tendencies in electronics progress

The movement to nano-electronics is accompanied by:

Increasing the transistor speed;
Reducing transistor size;
Packing more transistors onto a single chip.

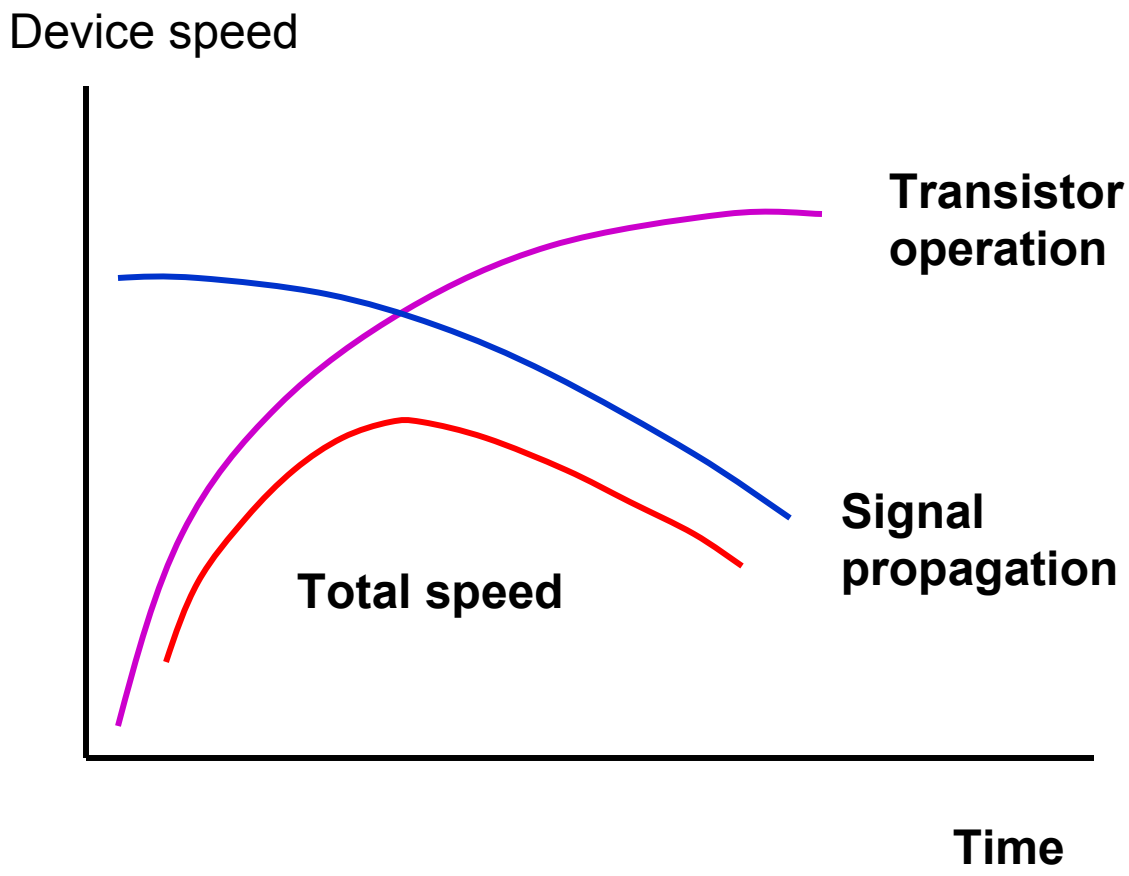
Here we meet the new significant emerging factor: slowing speed of signal propagation within the chip.

Interconnects in integrated schemes

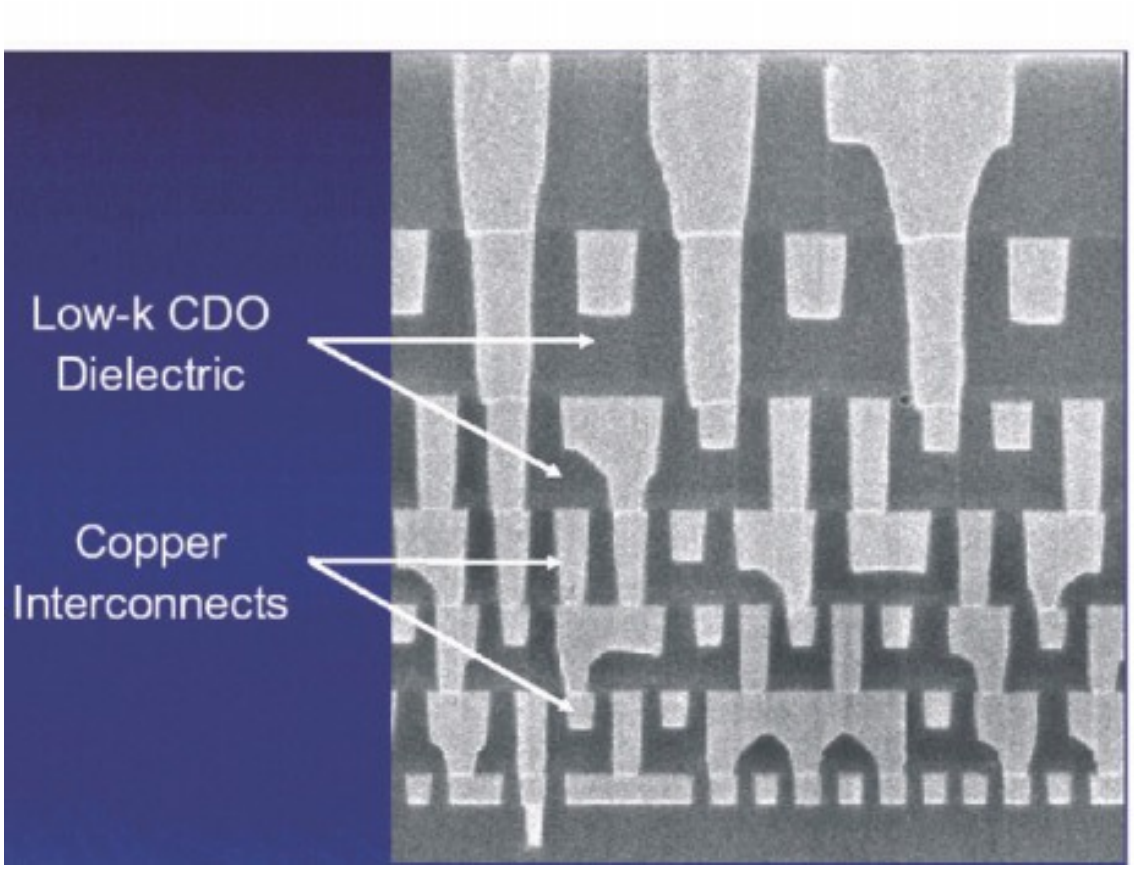


$$C = \frac{\varepsilon_0 \varepsilon S}{d}$$

This obstacle can be overcome by improvement of low-k materials

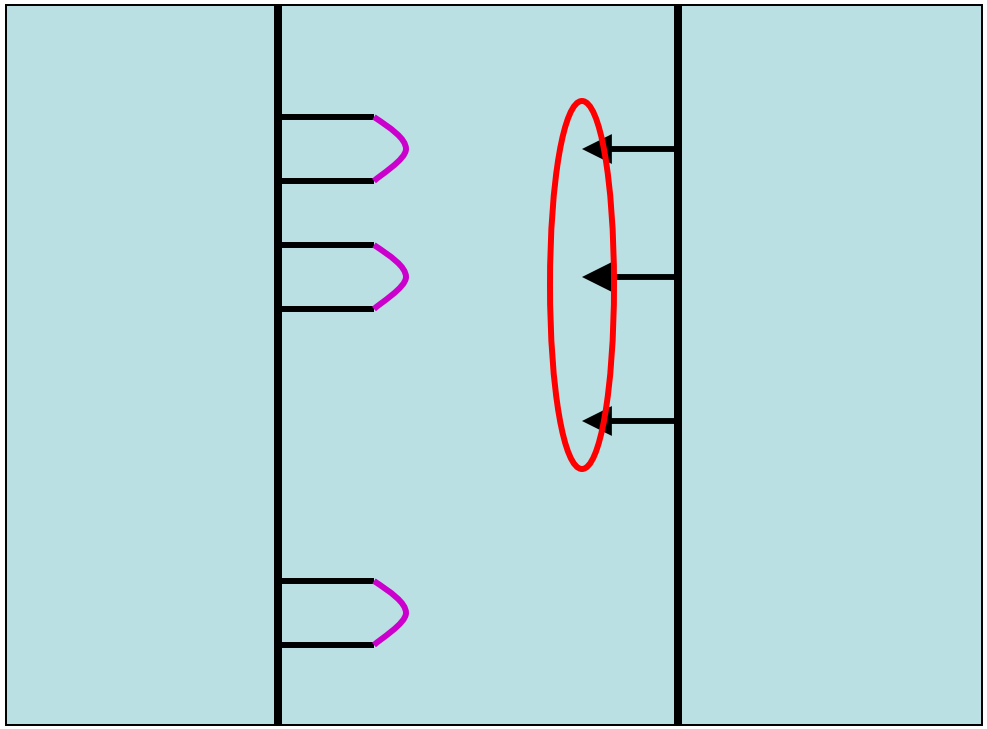


Real picture of interconnects



Rounding ways - principally new devices

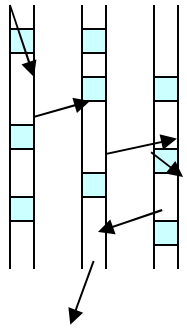
Track electronics: magnetic sensor



Rounding ways - principally new devices

Track electronics: novel electronic amplifier

In experimental works of D. Fink and colleagues the effect of current spikes was found for ions passing through electrolyte-filled ion tracks in polymers.



A bundle of tracks in the region of their higher density. Blue squares are carbonaceous clusters partitions. Black arrows indicate the trajectory of proton's passing.

Nanotechnology is a continuation of the new chapter in the acceleration of advanced technologies, and it may indicate the transformation of the future global economy…

Scince,2001

By fostering entrepreneurship and evelopment of new technology, Kuwait hopes to diversify its oil-dependent economy by exploring new markets driven by science and technology, and by reducing reliance on a few large organizations in favor of a more balanced ecosystem comprised of businesses of all sizes. To help advance these goals, the Sheikh announced an $87 billion program.

Conclusions

- **Modern development of technologies in nanomaterials has significant achievements in comparison with nanodevices.**
- **In the field of nanodevices we met principal obstacles, in particular, connected with flicker-nose parameters.**
- **The perspective way in the nanotechnology of devices is creation of novel types of devices using new conditions in nanosize range.**
- **Such devices are already appeared, as for example "track electronics". They demonstrate principally new possibilities in electronics.**