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# **THE PRODUCTION REVOLUTIONS THEORY AND FORTHCOMING TECHNOLOGIES**

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# PRODUCTION REVOLUTIONS

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- **The Agrarian (or Neolithic)**
- **The Industrial**
- **The Information-Scientific** —→ **Cybernetic**

# PRODUCTION PRINCIPLES

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- **Hunter-Gatherer**
- **Craft-Agrarian**
- **Industrial**
- **Information-Scientific**

# PHASES OF PRODUCTION REVOLUTION

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- **The initial phase**, when the advanced technologies are developed which later become widespread.
- **The final phase** of production revolution results in the flourishing of a new production principle.

# PHASES OF PRODUCTION REVOLUTION

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## Agrarian Revolution:

- The **initial phase** is the transition to *primitive hoe agriculture and animal husbandry* starting about 12–9 thousand years ago;
- The **final phase** is the transition to *irrigation or non-irrigation plough agriculture* starting about 5.5 thousand years ago.

# PHASES OF PRODUCTION REVOLUTION

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## Industrial Revolution

- The **initial phase** is a vigorous *development of seafaring and trade, mechanization on the basis of water engine* and other processes in the 15<sup>th</sup> – 16<sup>th</sup> centuries.
- The **final phase** is the *industrial breakthrough* (the 1760s–1830s) connected with the introduction of various machines and steam energy.

# PHASES OF PRODUCTION REVOLUTION

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## Cybernetic Revolution

- The **Initial** phase (**scientific-informational epoch**) which dates to the 1940s – 1990s.
- The **final** phase, which we call the **epoch of controllable systems**, will begin in the 2030–2040s and will last until the 2060–2070s.

# **THE EPOCH OF CONTROLLABLE SYSTEMS**

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**The revolution is called cybernetic because**

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- **the value of this revolution after its completion lies in the ability to create systems of different levels that could be self-controlled or indirectly controlled either through other systems or by means of point impact and corrections.**



# CYBERNETIC REVOLUTION

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**The revolution is called cybernetic because**

- **the main changes will take place including the rapid increase of opportunities to control various processes in different ways;**
- **the main vector of this revolution will be associated with a synthesis of principle characteristics of various systems which cybernetics deals with: the biological, social and technological ones.**

# THE LEADING TRENDS OF THE CYBERNETIC REVOLUTION

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- **Biotechnologies**
- **Human medicine**
- **Nanotechnologies**

# CHARACTERISTICS OF THE CYBERNETIC REVOLUTION

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- **Self-regulation.**
- **Individualization.**
- **The resource and energy saving.**
- **The development of the predetermined but previously non-existent properties.**
- **Miniaturization.**

# **BIOTECHNOLOGY**

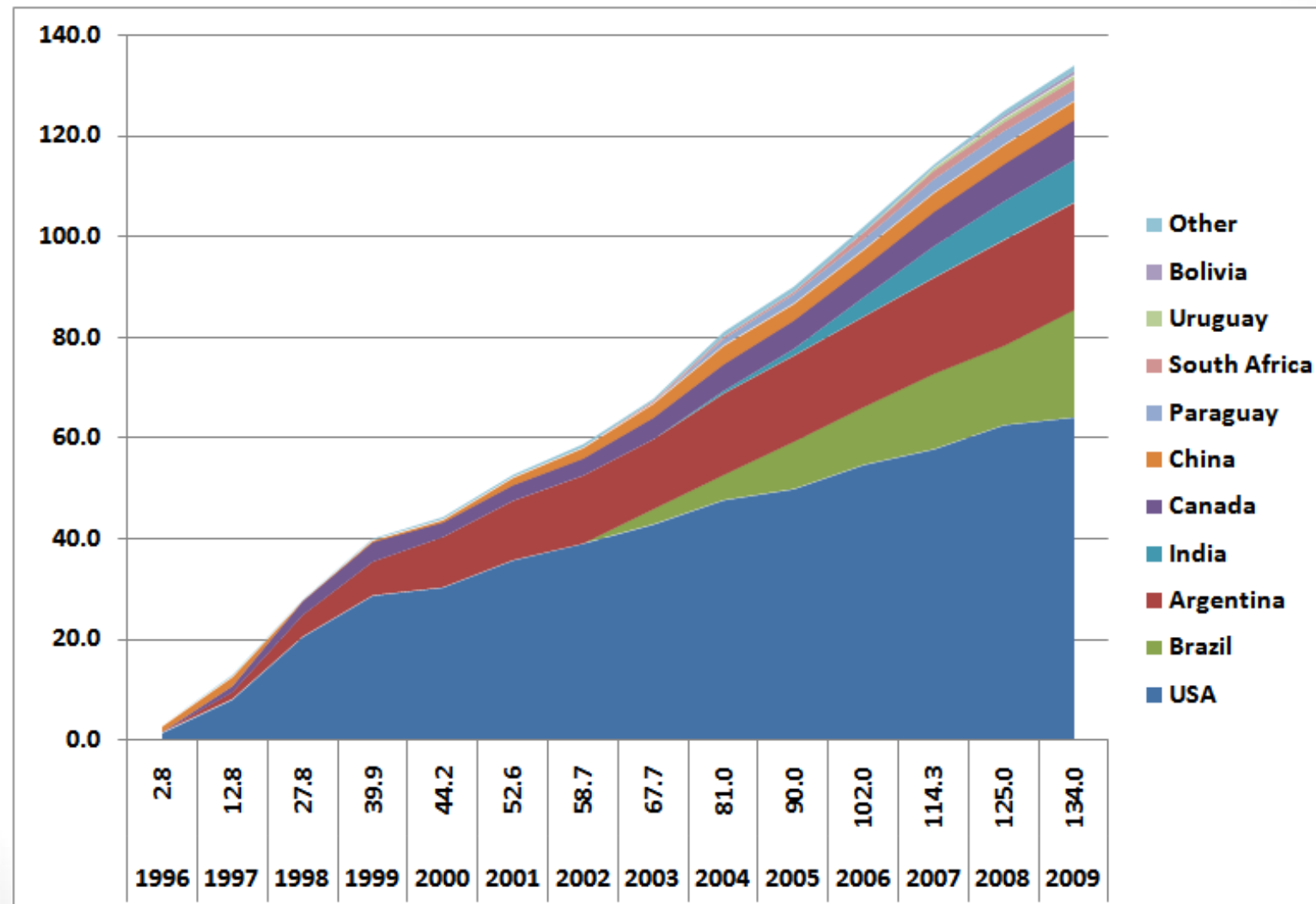
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## **THE MAIN BIOTECHNOLOGICAL TRENDS ARE**

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- **The production of nutritional supplements and medicines**
- **The genetic engineering**
- **The cellular engineering**
- **Cloning**
- **Creating alternative energy resources**

# INDIVIDUALIZATION IN BIOTECHNOLOGY

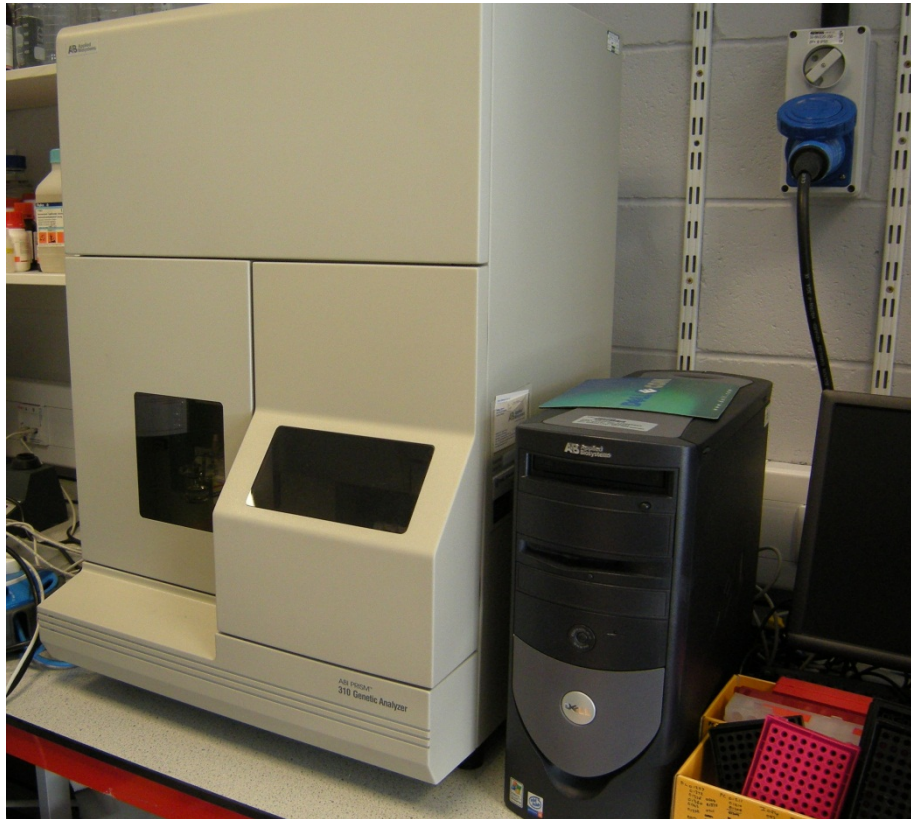


**Fig. 1. GMO acreage world**

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# INDIVIDUALIZATION IN BIOTECHNOLOGY

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**Fig. 2. DNA Sequencer today**

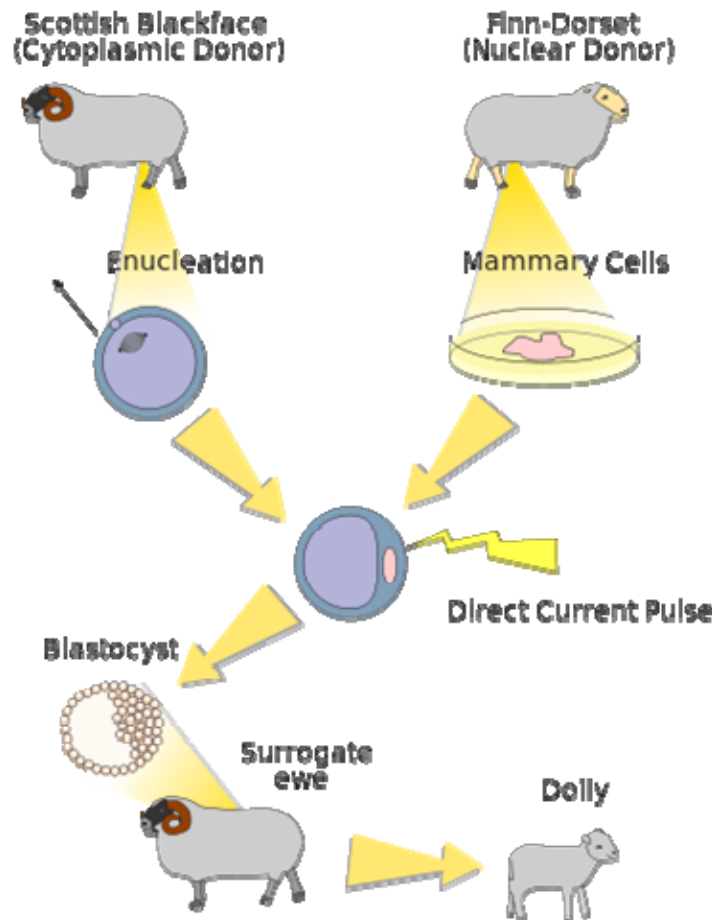
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**Fig. 3. DNA Sequencer tomorrow**

# INDIVIDUALIZATION IN BIOTECHNOLOGY

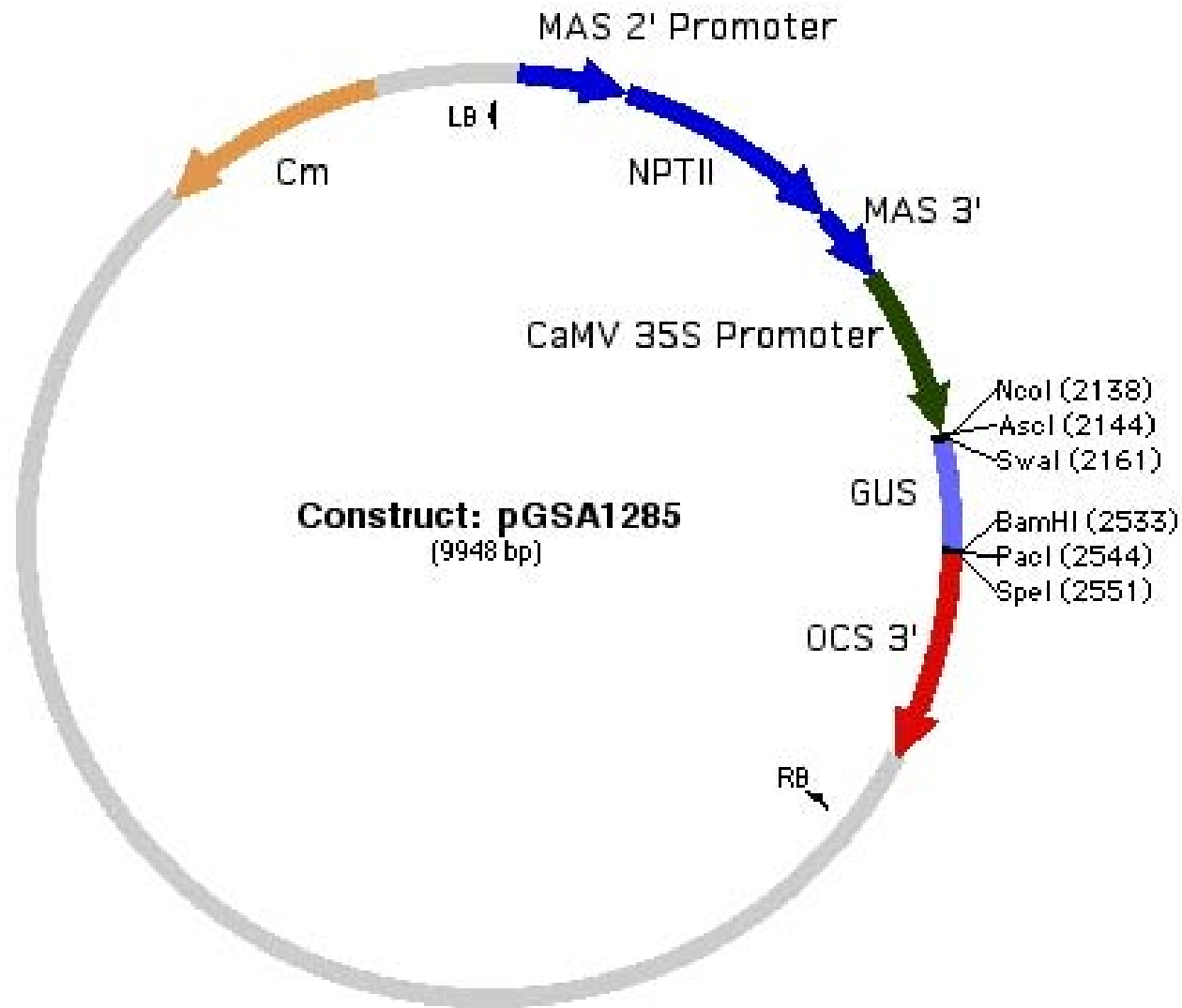
## CLONING



**Fig. 4 The cloning of Dolly**

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# SELF-REGULATION IN BIOTECHNOLOGY



**Fig. 5. Gene construction**



# ENERGY AND RESOURCE SAVING IN BIOTECHNOLOGY

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- **The biotechnological industry lowers the production costs significantly.**
- **A number of alternative energy resources are developed by means of biotechnologies, for example, bioethanol, biodiesel, biogas, biohydrogen etc.**

# MEDICINE

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## THE MOST DEVELOPING BRANCHES OF MEDICINE:

- Pharmaceuticals;
- Aesthetic medicine;
- Fight against cureless diseases;
- Implantation;
- Reproductive medicine;
- Gene therapy.

# INDIVIDUALIZATION IN MEDICINE

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- **AN INDIVIDUAL  
TREATMENT PROGRAM**
- **GENE THERAPY**

# INDIVIDUALIZATION IN MEDICINE

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## BIONICS

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**Fig. 6. Amanda Kitts using her bionic arm to squirt mustard**

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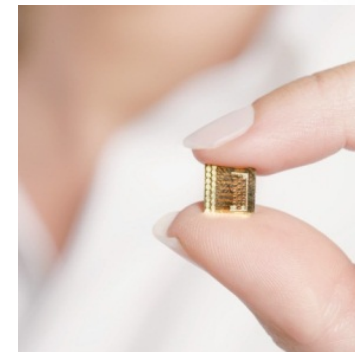
**Fig. 7. Tim Hemmes with the DARPA arm**

# SELF-REGULATION IN MEDICINE

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**Fig. 9. Da Vinci SHDI**



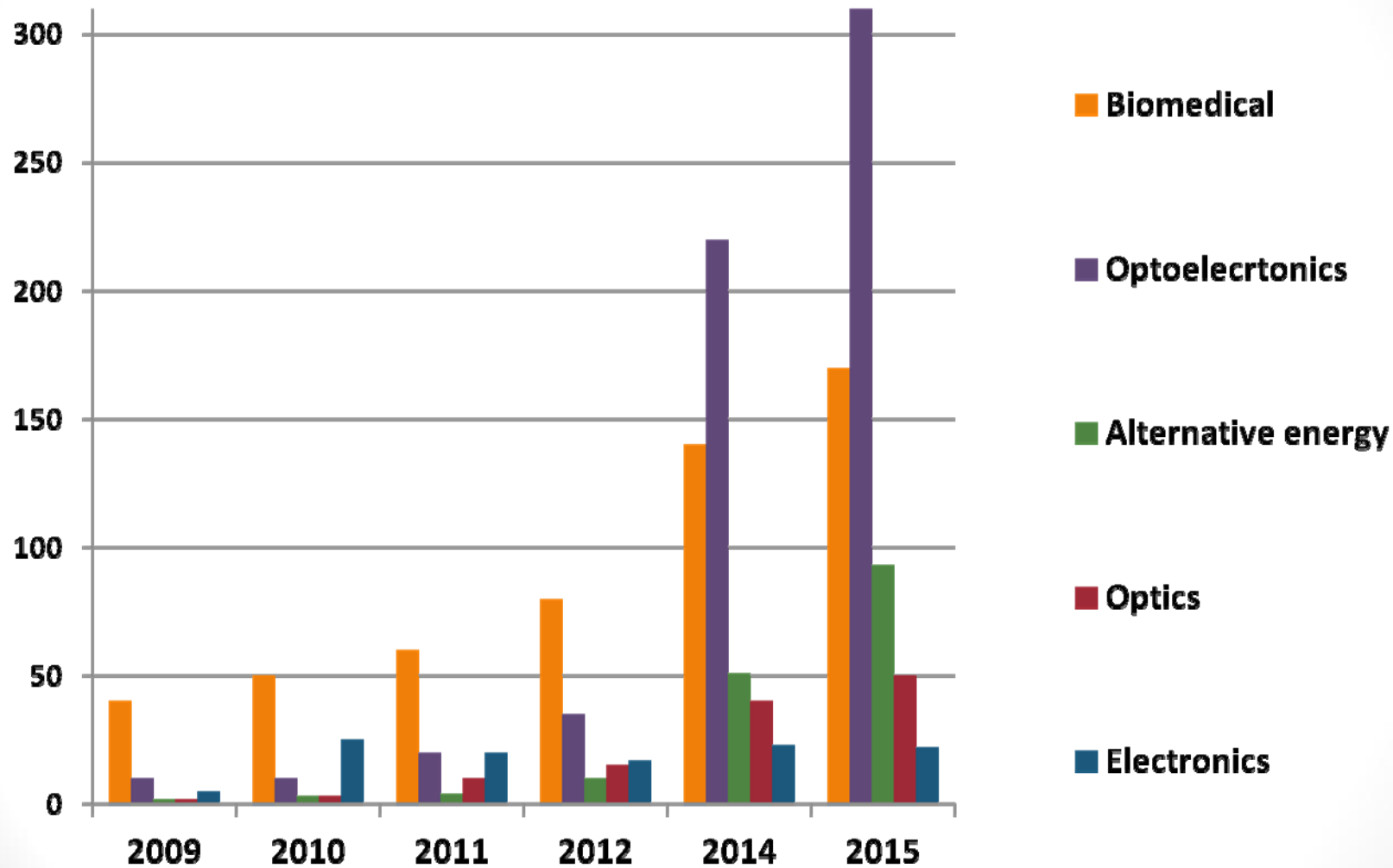
**Fig. 8. Biochip**

# ENERGY AND RESOURCE SAVING

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- **The number of the produced medical products is constantly growing.**
- **The most precise diagnostic methods will give an opportunity to define the required concentrations and forms of medicines, thereby reducing the patient's expenses and reducing the price for the treatment.**

# NANOTECHNOLOGIES



**Fig. 10. The global market of nanotechnology (\$ millions)**

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# INDIVIDUALIZATION IN NANOTECHNOLOGIES

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- In medicine: biochips created on the biotechnological basis.
- Individualization in agriculture.
- Individualization in devices.



**Fig. 11. Nokia Human Form**

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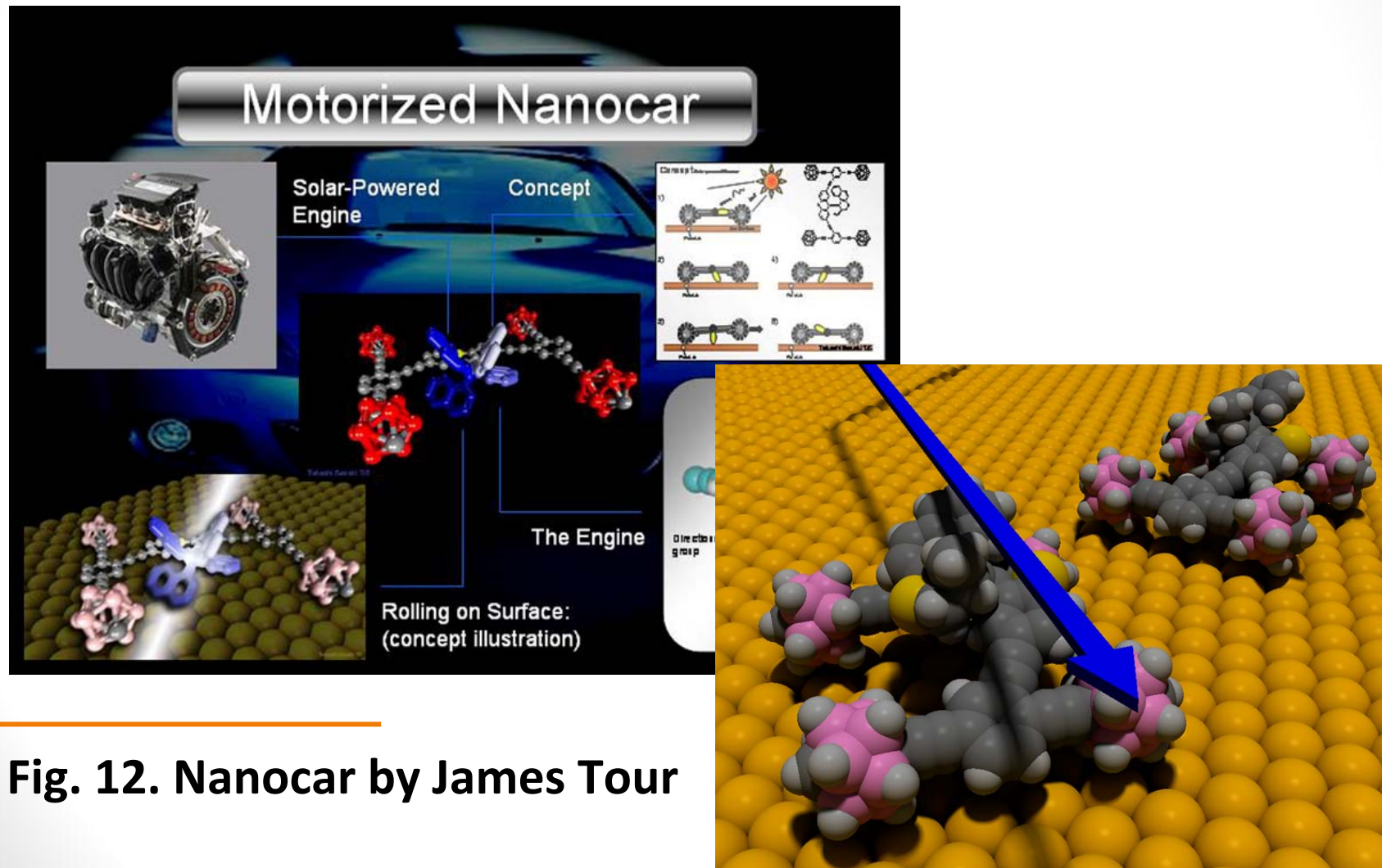


# SELF-REGULATION IN NANOTECHNOLOGIES

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- **The most important task for nanotechnologies is to make molecules or atoms to group in a self-organized way and to produce new ones resistant to the changing conditions.**
- **One of the main conceptions of nanotechnology is from larger to smaller.**

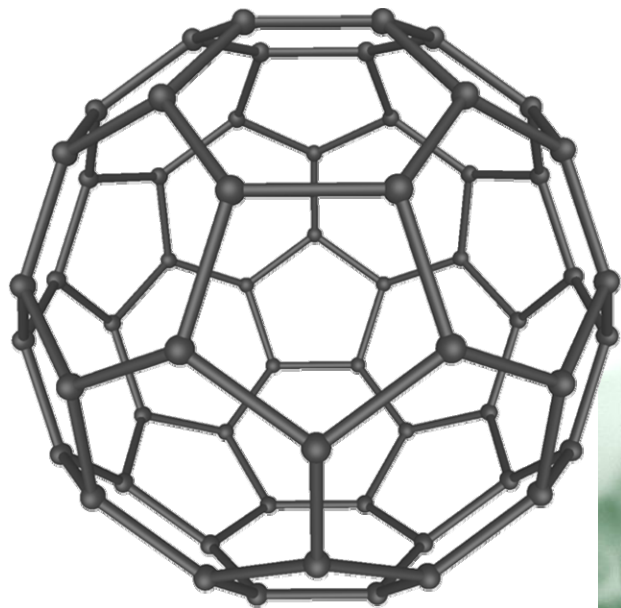
# SELF-REGULATION IN NANOTECHNOLOGIES



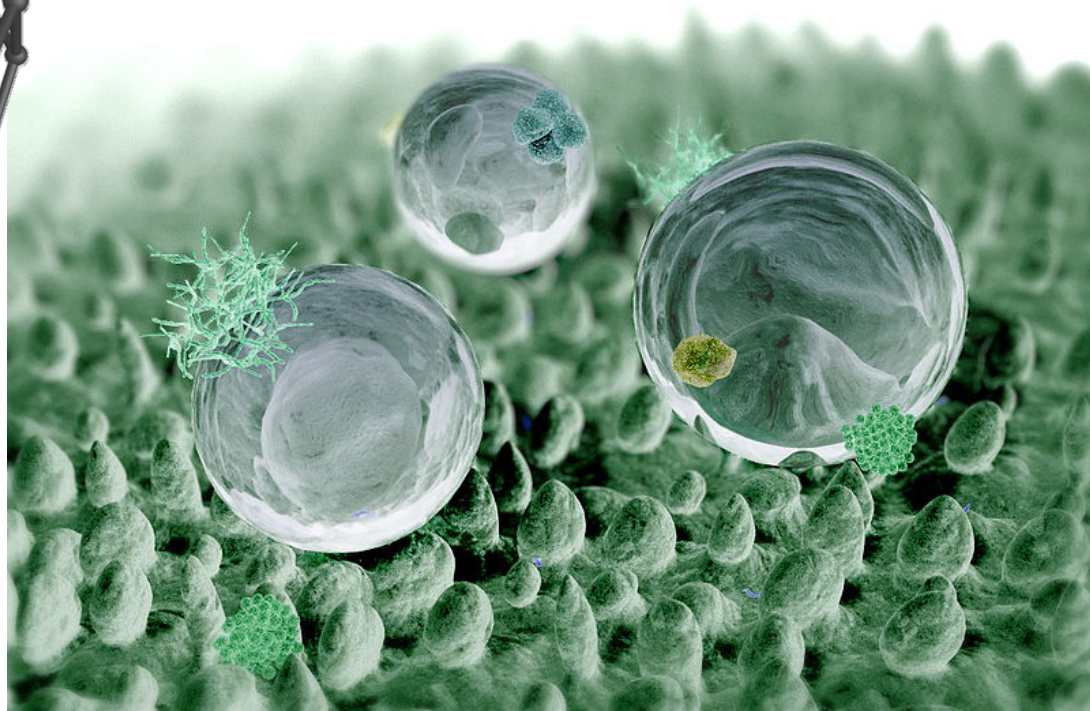
**Fig. 12. Nanocar by James Tour**

# SELF-REGULATION IN NANOTECHNOLOGIES

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**Fig. 13. Fullerene**



**Fig. 14. “Lotus effect”**

# RESOURCE AND ENERGY SAVING

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## SOME EXAMPLES:

**“Clever glass”**

- **Electronic paper**
- **Producing electricity through the organic matter destruction**

# CONCLUSION

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- All the trends of the Cybernetic revolution will be tightly interconnected and support each other.
- Revolution of controllable systems will originate in a narrow sphere.
- The final stage of the Cybernetic revolution will start at the intersection of medicine, biotechnology and gene engineering (probably with nanotechnologies).

# CONCLUSION

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- The general vector of the breakthrough can be defined as a rapid growth of possibilities to correct or even modify the human biological nature itself .
- Among other results we can achieve a radical expansion of our opportunities to prolong life and improve its biological quality.
- It will take about two or three decades after the beginning of the Cybernetic revolution (in the 2030-2040s) before a wide application takes place.

# **Thank you for attention!**