

GNR: Three Overlapping Revolutions

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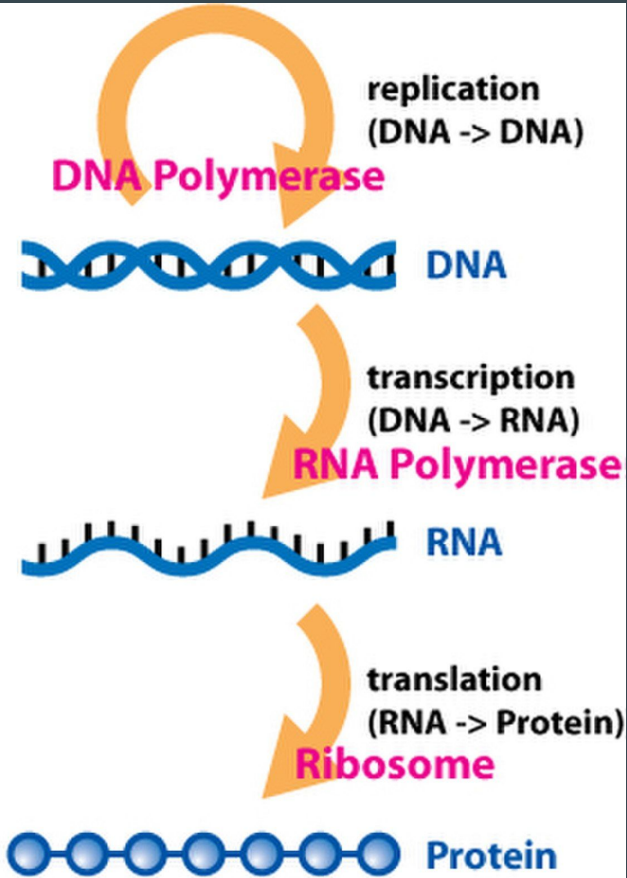
Подготовил ст. гр. 3530201/00101 Перекрестов Г. В.

Who will be man's successor? To which the answer is: We are ourselves creating our own successors. Man will become to the machine what the horse and the dog are to man; the conclusion being that machines are, or are becoming, animate.

— SAMUEL BUTLER

Life's Computer

The chemical structure of the DNA molecule was first described by J. D. Watson and F. H. C. Crick in 1953 as a double helix consisting of a pair of strands of polynucleotides.





Baby Boomer

[bā-bē bü-mər]

A term used to describe a person who was born between 1946 and 1964

Can We Really Live Forever?

De Grey uses the metaphor of maintaining a house. How long does a house last? The answer obviously depends on how well you take care of it. If you do nothing, the roof will spring a leak beforelong, water and the elements will invade, and eventually the house will disintegrate. But if you proactively take care of the structure, repair all damage, confront all dangers, and rebuild or renovate parts from time to time using new materials and technologies, the life of the house can essentially be extended without limit.

Gene expression is the process by which information from a gene is used in the synthesis of a functional gene product that enables it to produce end products, protein or non-coding RNA, and ultimately affect a phenotype, as the final effect.

Gene Chips



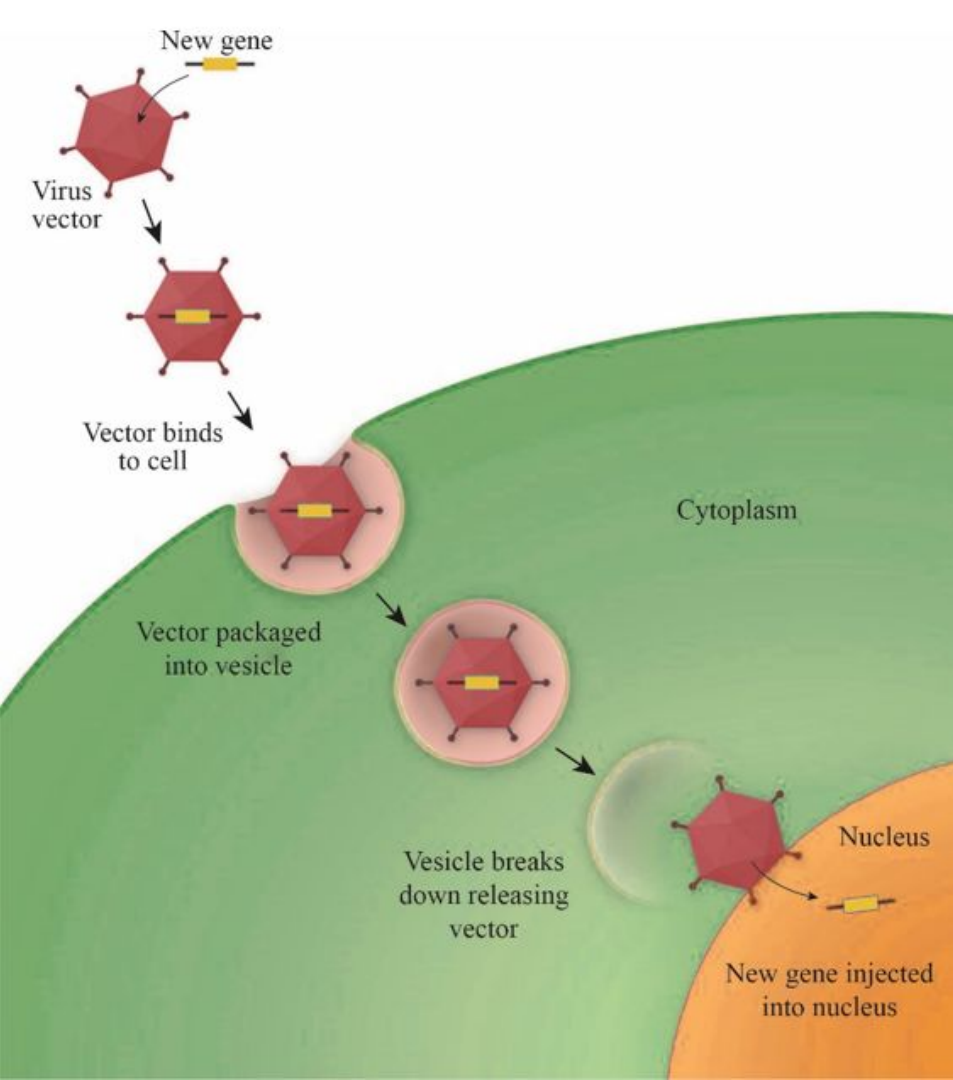
Genetic profiling is now being used to:

- Revolutionize the processes of drug screening and discovery;
- Improve cancer classifications;
- Identify the genes, cells, and pathways involved in a process, such as aging or tumorigenesis;
- Determine the effectiveness of an innovative therapy;
- Test the toxicity of compounds in food additives and etc.

Somatic gene therapy

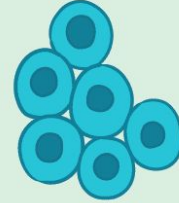
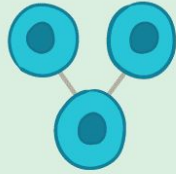
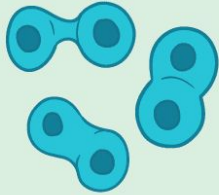
Gene delivery methods:

- Viruses as shown on the slide;
- Physical injection;
- Liposomes;
- Electric pulses.

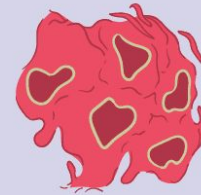
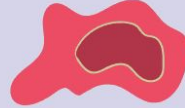


Cancerous cells

NORMAL CELLS



CANCEROUS CELLS



Many cells that continue to grow and divide

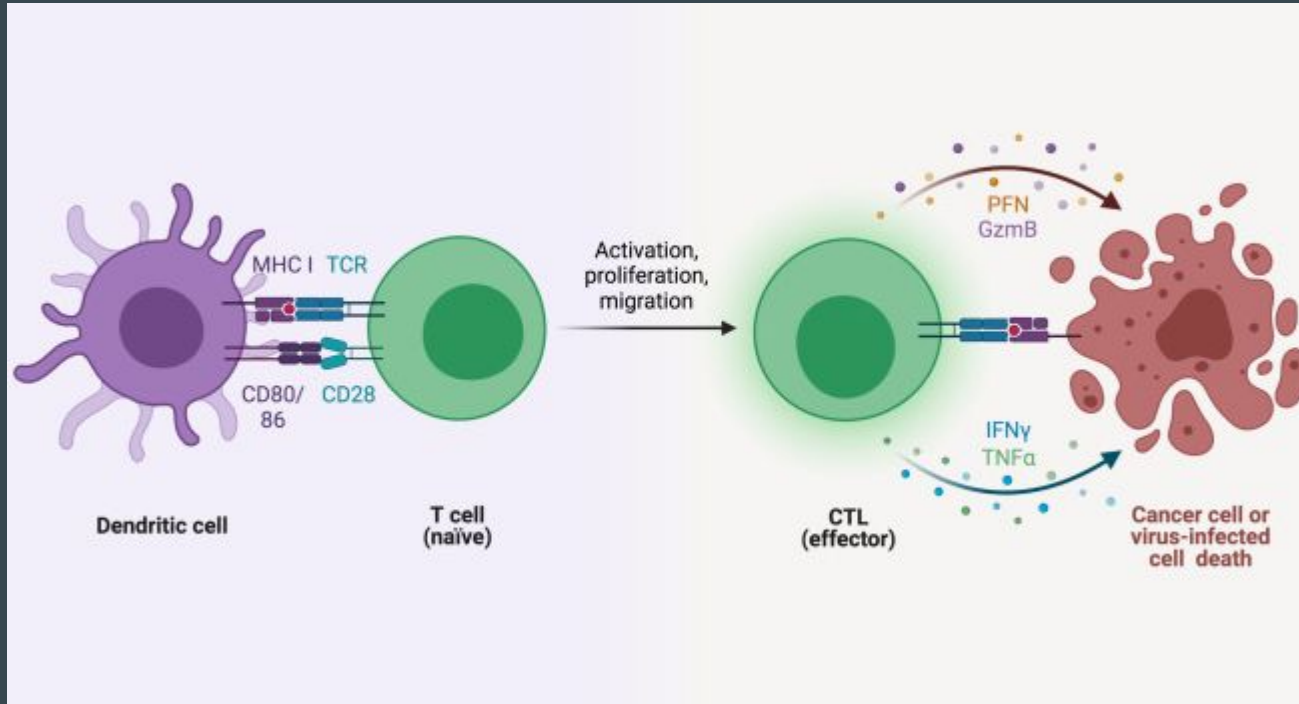
Variations in size and shapes of cells

Nucleus that is larger and darker than normal

Abnormal number of chromosomes arranged in a disorganized fashion

Cluster of cells without a boundary

Overcoming Cancer



A T cell is a type of lymphocyte. T cells are one of the important white blood cells of the immune system and play a central role in the adaptive immune response. T cells can be distinguished from other lymphocytes by the presence of a T-cell receptor (TCR) on their cell surface.

Application of cloning

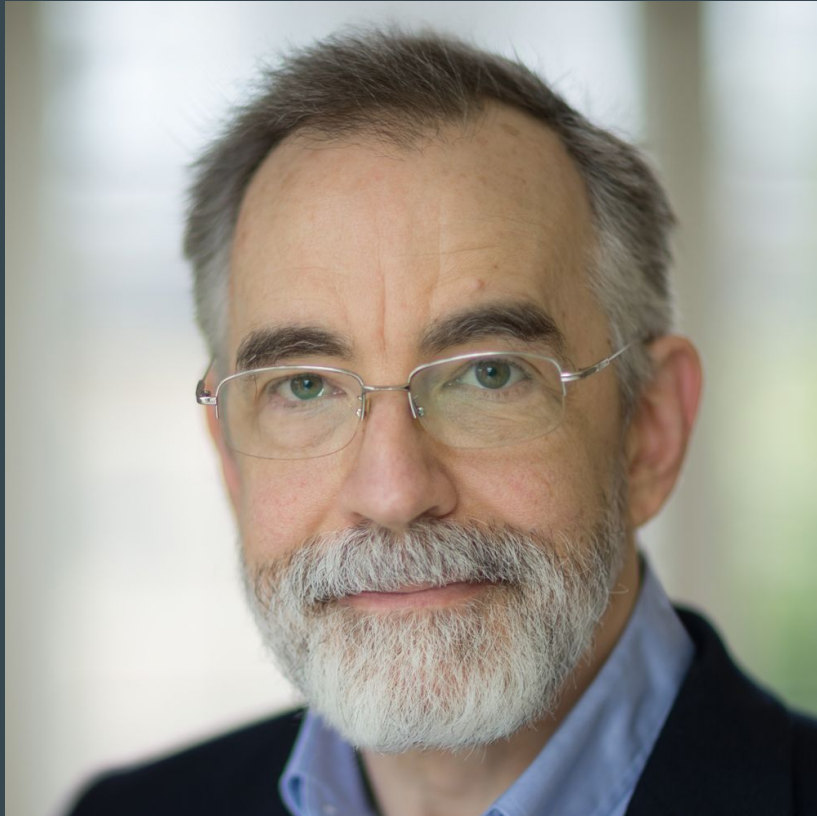
- Therapeutic cloning;
- Improved breeding by offering the ability to directly reproduce an animal with a desirable set of genetic traits;
- Preserving endangered species and restoring extinct ones;
- Human somatic-cell engineering;
- Solving world hunger;
- Human Cloning.

Nanotechnology: The Intersection of Information and the Physical World

But I am not afraid to consider the final question as to whether, ultimately, in the great future, we can arrange the atoms the way we want; the very atoms, all the way down!

—RICHARD FEYNMAN

Molecular assembler



Kim Eric Drexler (born April 25, 1955) is an American engineer best known for studies of the potential of molecular nanotechnology (MNT), from the 1970s and 1980s. His 1991 doctoral thesis at Massachusetts Institute of Technology was revised and published as the book *Nanosystems: Molecular Machinery Manufacturing and Computation* (1992), which received the Association of American Publishers award for Best Computer Science Book of 1992.

Molecular assembler

Drexler's thesis did provide extensive feasibility arguments for each of the principal components of a molecular assembler, which include the following subsystems:

- The computer;
- The instruction architecture;
- Instruction transmission;
- The construction robot;
- The robot arm tip;
- The assembler's internal environment;
- The energy.

The Biological Assembler

Nature shows that molecules can serve as machines because living things work by means of such machinery. Enzymes are molecular machines that make, break, and rearrange the bonds holding other molecules together. Muscles are driven by molecular machines that haul fibers past one another. DNA serves as a data-storage system, transmitting digital instructions to molecular machines, the ribosomes, that manufacture protein molecules. And these protein molecules, in turn, make up most of the molecular machinery.

—ERIC DREXLER

Fat and Sticky Fingers



Richard Errett Smalley was an American chemist who was the Gene and Norman Hackerman Professor of Chemistry, Physics, and Astronomy at Rice University. In 1996, along with Robert Curl, also a professor of chemistry at Rice, and Harold Kroto, a professor at the University of Sussex, he was awarded the Nobel Prize in Chemistry for the discovery of a new form of carbon, buckminsterfullerene, also known as buckyballs. He was an advocate of nanotechnology and its applications.

This could be your part of the presentation...

Thesaurus

- **Synergy** is the combined power of a group of things when they are working together that is greater than the total power achieved by each working separately.
- **Gene** is a part of the DNA in a cell that controls the physical development, behaviour, etc. of an individual plant or animal and is passed on from its parents.
- **Genome** is the complete set of genetic material of a human, animal, plant, or other living thing.
- **Somatic** - relating to the body as opposed to the mind.
- **Transdifferentiation** is a process in which one type of adult tissue undergoes a phenotypic switch and differentiates to another type of adult tissue.