

---

## CHRONICLES

---

# 2007 Nobel Prize Winners in Physiology and Medicine

DOI: 10.1134/S0006297908020168

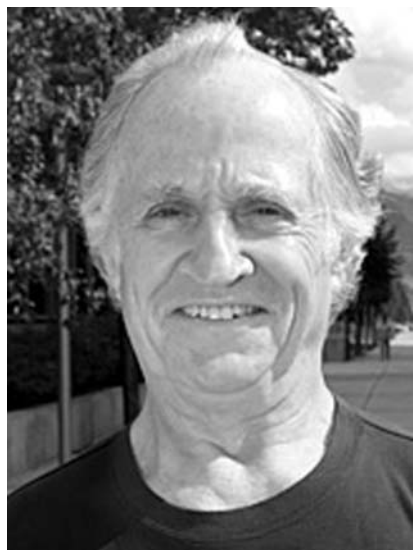
The Nobel Prize in Physiology and Medicine was given October 2007, although the work was worthy of the Prize at least ten years ago because the revolutionary importance for biology and medicine of genetic knockout technology in mice was quite clear even in the early 1990s.

The crucial experiments resulting in this discovery were conducted in the middle of the 1980s. This technology consists of two main components. First, embryologists (represented by Sir Martin J. Evans, working now in Cardiff) learned to cultivate embryonic stem mouse cells under conditions preventing the loss of pluripotency (i.e. on further manipulations, the cells retain the capability of differentiating in any direction, of creating any tissue and organ, and even of a whole living organism (clone)). Second, researchers in the laboratory of Mario R. Capecchi (Medical Faculty, Utah State University) and Oliver Smithies (then at Wisconsin State University, now North Carolina State University) learned to introduce a heterologous genetic material (e.g. a plasmid DNA) into human and mouse somatic cell cultures and achieve a rare event of homologous recombination, i.e. the incorporation of the construct (the cloned gene) DNA into the

genome stretch with which the genetic construct had a sufficiently long homologous region. The introduction of heterologous DNA into various cell types could be realized earlier, but this DNA either incorporated into accidental stretches of the genome or did not incorporate at all. Thus, it was impossible to “direct” DNA into the chosen genetic locus and destroy the gene located in it and to “knockout” this gene (this boxer’s term is only a tribute to Hollywood traditions in Western science, which has difficulties in attracting attention without a biting word; moreover, such words also help to get financial support).

At first, genes were modified the absence of whose functions allowed the researchers to perform a direct selection of the cells (the clones able to grow only on a defined medium). Then Capecchi invented and realized a selection procedure to pick out cells with a very rare but desired event of the homologous recombination in any gene. Principal reports describing this triumphal technology, which is now awarded the Nobel Prize, were published in 1985-1988.

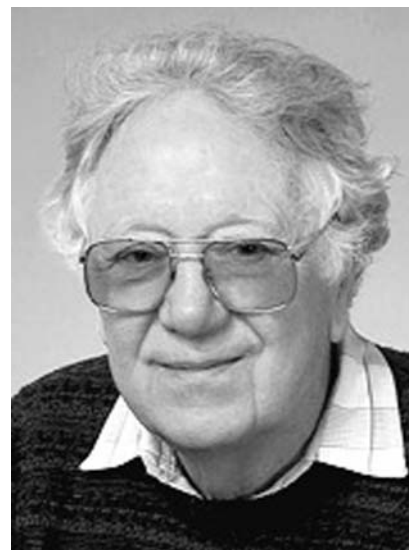
The 2007 laureates are not too young (Smithies is 82, Capecchi is 70, and Evans is 66), but luckily they are in good health on meeting their triumph. We are especially



Mario R. Capecchi



Martin J. Evans



Oliver Smithies

glad for a very modest Italian Mario Capecchi, who after a tragic homeless childhood in Europe managed to get education in USA and become an outstanding scientist.

It is a pity that only three persons may be awarded the Prize. Because it was reasonable for the German Klaus Rajevsky, a descendant of the famous Borodino battle hero (an also of Mikhail Lomonosov as it has become known recently) and now a professor at Harvard University, to be the fourth in this company. His laboratory in Cologne (he had been working in his native land Germany during the major part of his life) has accomplished more than anybody (and possibly even more than the Prize winners of this year) to elaborate the best technology of genetic knockout as nearly a routine method in biological studies, including such an important section of medical biology as immunology.

Thousands of knockout mice produced in the world by now have been of help to discover the most important mechanisms of the organism's development, systems of its defense and aging, and for finding out causes of many diseases, in particular cancer. Many of these results may be also immediately "translated" onto humans and thus are of importance for medicine. The prospects of investigations in this line could scarcely be overestimated.

Unfortunately, Russian science is very modestly represented at this festival of knowledge. We can only hope that in parallel with the recovery of economic power of Russia, the development of such a vitally important (but rather expensive) line of bioengineering as genetic knockout technology will be adequately supported. This is also a kind of nanotechnology because the manipulations are performed at the level of nucleotides.

*S. A. Nedospasov,  
Doctor of Biology, Professor,  
Corresponding Member of the Russian Academy of Sciences*