

## **Nobel Prize in Physiology or Medicine 2012 for Reprogramming Cells to be Pluripotent**

Curious Cat Science and Engineering Blog

The [Nobel Prize in Physiology or Medicine 2012](#) [1] was awarded “for the discovery that mature cells can be reprogrammed to become pluripotent.” The prize goes jointly to [Sir John B. Gurdon](#) [2], Gurdon Institute in Cambridge, UK and [Shinya Yamanaka](#) [3], Kyoto University (he is also a senior investigator at the Gladstone Institutes in the USA).

The Nobel Prize recognizes two scientists who discovered that mature, specialised cells can be reprogrammed to become immature cells capable of developing into all tissues of the body. Their findings have revolutionised our understanding of how cells and organisms develop.

John B. Gurdon discovered (in 1962) that the specialisation of cells is reversible. In a classic experiment, he replaced the immature cell nucleus in an egg cell of a frog with the nucleus from a mature intestinal cell. This modified egg cell developed into a normal tadpole. The DNA of the mature cell still had all the information needed to develop all cells in the frog.

Shinya Yamanaka discovered more than 40 years later, in 2006, how intact mature cells in mice could be reprogrammed to become immature stem cells. Surprisingly, by introducing only a few genes, he could reprogram mature cells to become pluripotent stem cells, i.e. immature cells that are able to develop into all types of cells in the body.

These groundbreaking discoveries have completely changed our view of the development and cellular specialisation. We now understand that the mature cell does not have to be confined forever to its specialised state. Textbooks have been rewritten and new research fields have been established. By reprogramming human cells, scientists have created new opportunities to study diseases and develop methods for diagnosis and therapy.

All of us developed from fertilized egg cells. During the first days after conception, the embryo consists of immature cells, each of which is capable of developing into all the cell types that form the adult organism. Such cells are called pluripotent stem cells. With further development of the embryo, these cells give rise to nerve cells, muscle cells, liver cells and all other cell types – each of them specialised to carry out a specific task in the adult body. This journey from immature to specialised cell was previously considered to be unidirectional. It was thought that the cell changes in such a way during maturation that it would no longer be possible for it to return to an immature, pluripotent stage.

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<http://www.ecnmag.com/blogs/2012/10/nobel-prize-physiology-or-medicine-2012-reprogramming-cells-be-pluripotent>

**Links:**

[1] [http://www.nobelprize.org/nobel\\_prizes/medicine/laureates/2012/](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2012/)

[2] <http://www.gurdon.cam.ac.uk/gurdon.html>

[3] <http://gladstoneinstitutes.org/scientist/yamanaka>