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In the news

AND THE WINNER IS...

This year's Albert Lasker Basic Medical Research Award goes to John Gurdon and Shinya Yamanaka for their discoveries on nuclear reprogramming. This process instructs fully differentiated adult cells to revert to early embryonic stem (ES) cells, which, when transplanted into an egg, can restart development and give rise to any tissue type. Understanding how to reprogramme cells provides invaluable experimental and therapeutic tools to study diseases, screen drugs and develop personalized cell replacement therapies without the risk of immune rejection.

Until the 1950s it was unclear whether cells lose some genes during differentiation or just switch their genes on and off. Gurdon addressed this question by replacing the nucleus of a frog's egg with one from a differentiated cell and assessing whether it could develop into a complete animal. At first he used embryonic cell nuclei and eventually he generated fully developed frogs using nuclei from increasingly specialized cells and older animals. This showed that differentiated cells retain their full genome and can therefore be reprogrammed.

In recent years, many efforts have been made to obtain various functional cell types from ES cells, but the isolation of human ES cells is both technically difficult and ethically controversial. In 2006, to overcome these hurdles, Yamanaka's team reverted mouse fibroblasts to an embryonic state by introducing four transcription factors. These ES-like cells were termed induced pluripotent stem (iPS) cells. In 2007 they generated human iPS cells, which, "with the ability to differentiate into virtually all types of cells … have enormous potential for pharmaceutical and clinical applications." (Shinya Yamanaka, *Nature Medicine*, October 2009.)

The contributions of Gurdon and Yamanaka have changed our view on the stability of the differentiated state of cells.

Kim Baumann