

# Preface

“The world is changing” is a classical concern for people over forties. However, the era we live is a little bit different than the previous generations. We are more likely in between classical and contemporary or between fictions and facts. Change is unbearably fast and the story of biology is still far from to be completed. It is only a few weeks ago (September 22, 2011) particle physicists on the particle detect or named “Oscillation Project with Emulsion-tRacking Apparatus (OPERA)” experiment detected neutrinos traveling faster than light. Although it is too early to declare Einstein’s theory of special relativity is wrong, results would be said being so revolutionary at least. The same has happened in cell biology in 2006. Shinya Yamanaka and his team discovered that the completely differentiated somatic cell could exert its embryonic stem cell state potential with the available conditions. The method for turning a somatic cell to a pluripotent one was relatively easy, at least easier than one could imagine till Yamanaka’s paper. They named those cells as induced pluripotent stem cells (iPSCs).

Science is used to have such sudden pulses. However, there is always a resistance to unexpected changes. It generally takes longer time than necessary to interpret the discoveries having results that are applicable to many situations. Some scientists want to directly apply those results to a daily life as quickly as possible, while the others, whom being fascinated by reaching one more level of endless mystery, display a tendency to beware there is actually more. However, some with a special consciousness embark through explorations of unknown realities.

The discovery of iPSCs brought about all. Now many researchers are trying to refine the technique to serve those cells to restore human health. Some of them are trying to reach the furthest point in the dark corridors of cell biology, while they are aware that the battery of their torch is pushing its limits. However, very few of them opened a completely renewed era in biology by mathematical biology.

This manuscript is trying to explain the fundamentals behind the iPSCs and its applications. Most importantly, it attempts to show why we have to use mathematics to go further with iPSCs or another yet undiscovered cells. The theories of Stuart Kauffman and Sui Huang pointed out the ways to solve many problems in

cell biology and are being pored over by many people to quench their intellectual thirst. Dr. Huang is showing bravely how impossible to fathom by common sense of all data flooding from ‘omics’ works of biology. Fortunately, he is using general concepts or principles of physics and mathematics to establish a firm theoretical foundation.

Researchers from my team started from tooth regeneration and inescapably ended up with stem cell biology. I individually had begun to be involved in microbial aspects of dental diseases. Now I am being captivated by complexity and system biology, because it is hard not being exposed to the emergent patterns of every system that has a common connection: mathematics. Obviously iPSCs are providing great tools to study every aspects of biology, fundamentals through applications. In conclusion, iPSCs opened minds of scientist by showing that we should compel our imagination limits to see more.

I am grateful to Sui Huang for his generous and humble guidance. Thanks to Kursat Turksen to find me sufficient to write this manuscript. Thanks to Springer’s publishing team, especially to Renata Hutter and Aleta Kalkstein for their kind assistance. Thanks also to Kamil Can Akçalı who encouraged me to follow my instincts. Last but not least thanks to Muammer Saglam for his unconditional love that led me to feel the light.

Induced Pluripotent Stem Cells

Yildirim, S.

2012, VIII, 73 p. 8 illus., 5 illus. in color., Softcover

ISBN: 978-1-4614-2205-1