2017 SZCUF PRIZE

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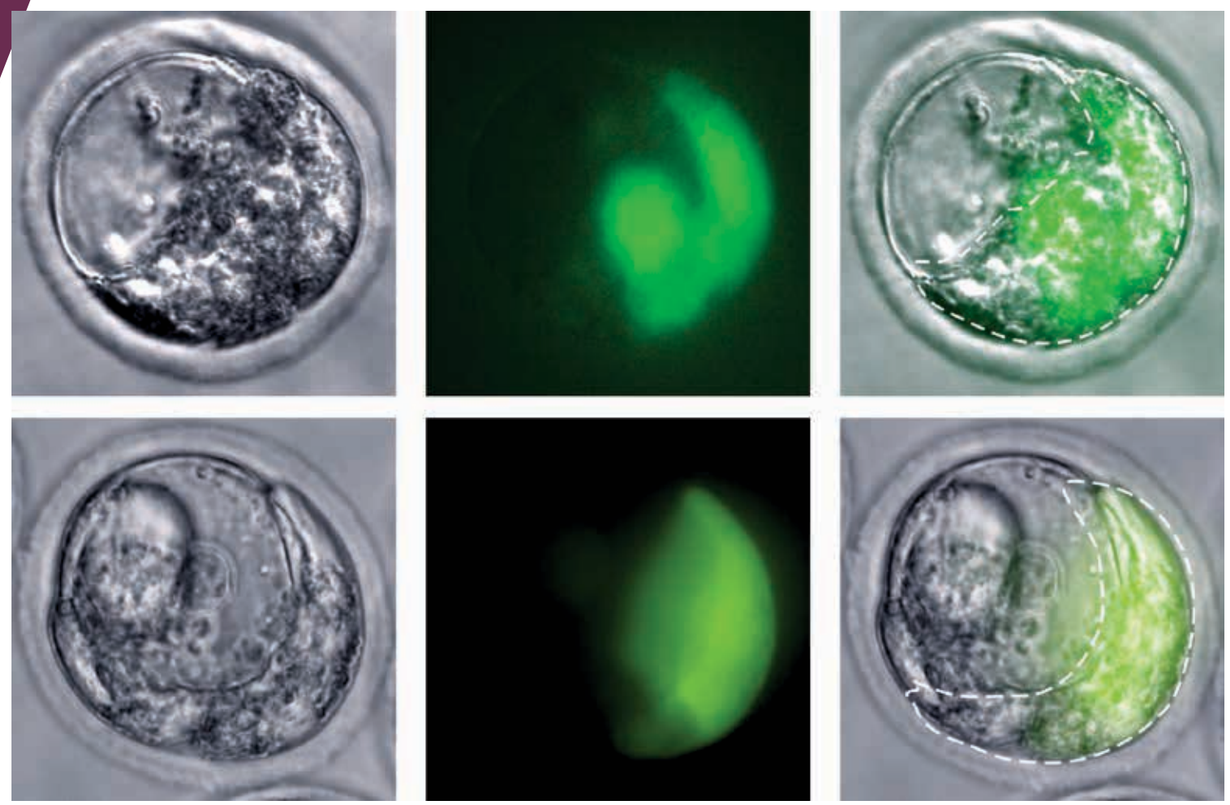
Sir Zelman Cowen Universities Fund Prize
For Discovery In Medical Research

Dr.
Yossi Buganim

Regenerative Medicine

Yossi Buganim received undergraduate degrees from Bar-Ilan University and a Ph.D. from Weizmann Institute of Science. As a postdoctoral fellow at Whitehead Institute for Biomedical Research, MIT, Dr. Buganim exploited single-cell technologies along with bioinformatic approaches to shed light on the molecular mechanisms underlying somatic cell undergoing reprogramming to embryobic stem-like cells. Currently, his own laboratory, at The Hebrew University, is focused on multiple *in vitro* and *in vivo* somatic cell conversion models to allow the generation of multiple cell types for future clinical use.

Representative bright field and fluorescence images of engineered mouse embryos at the blastocyst stage expressing a GFP reporter (green signal) in the ICM, a compartment in the blastocyst that will give rise to the embryo proper.



Dr. Buganim has been awarded the **2017 Sir Zelman Cowen Universities Fund Prize** for Medical Research for his extensive and groundbreaking work in regenerative medicine.

Regenerative medicine is a new and developing field aimed at engineering, regenerating or replacing human cells, tissues or organs, in order to establish or restore normal function. Embryonic stem cells (ESCs) have enormous potential in this area because they can differentiate into all cell types in the human body. However, two significant obstacles prevent their immediate use in medicine: ethical issues related to terminating human embryos, and rejection of foreign cells by the patient's immune system. The creation of ES-like cells from skin cells, induced pluripotent stem cells (iPSCs), resolved both issues.

Despite these cells' enormous potential, their quality is still not sufficient to be used in clinical practice, and there is a need to find the best protocol that will enable production of high-quality iPSCs that would not pose a danger to patients.

Dr. Buganim's laboratory has made two major breakthroughs in this area, representing major steps forward in the field of regenerative medicine and transplantation.

Project A
In order to improve the quality of embryonic stem cells, Dr. Buganim and his collegues conducted bioinformatic analyses which pointed to four new key genes capable of creating iPSCs from skin cells, of superior quality to stem cells in current use. These cells (in this case mouse cells) are able to clone a whole mouse with much greater success (80%) than other iPSCs (30%). This test is the most important one determining the quality of the cells.

Project B
Many women suffer recurrent miscarriages and abnormal placenta, which causes fetal growth restriction that can lead to mental retardation. Dr. Buganim's laboratory found the key genes of the placenta stem cells and by expressing them in surplus in skin cells, created induced placental stem cells. These cells looked and behaved like natural placental stem cells. Various quality tests showed that these cells have cell-generating capability *in vitro* and inside a placenta that develops following a transplant. The success of this project may enable women with placenta problems to give birth to healthy children.

Representative bright field and fluorescence images of skin cell-derived induced Sertoli cells (i.e. cells in the testis that are responsible for proper sperm production, green cells) and native peritubular cells surrounding them (red cells).