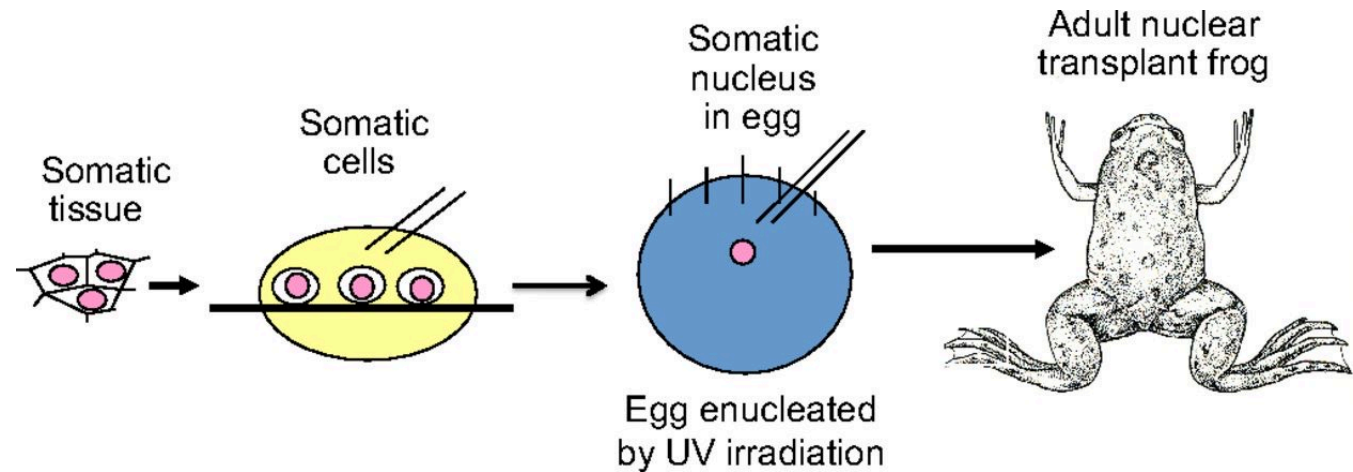
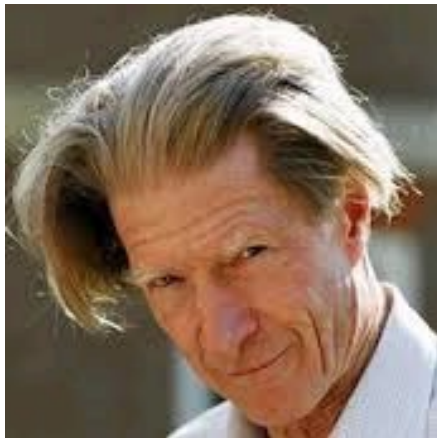


- **Biological question: organoids**

● The dawn of organoids: *Xenopus leavis*



John Gurdon



Nobel prize, 2012

Somatic nuclei, after transplantation into enucleated eggs, can develop into normal frogs. Therefore, at least some somatic cells can be reprogrammed.

● iPSCs: reprogramming somatic cells

Derived from somatic cells

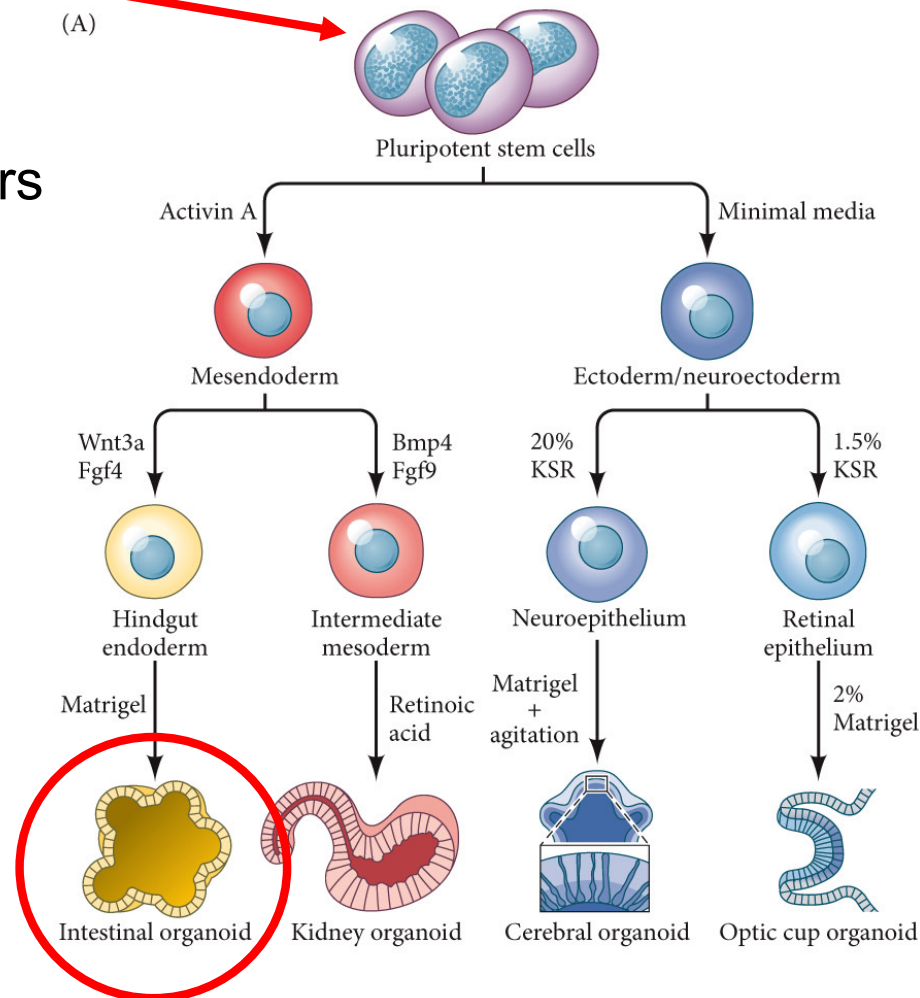
+

“Yamanaka” factors
(OCT4, KLF4,
c-MYC, SOX2)

Shinya Yamanaka

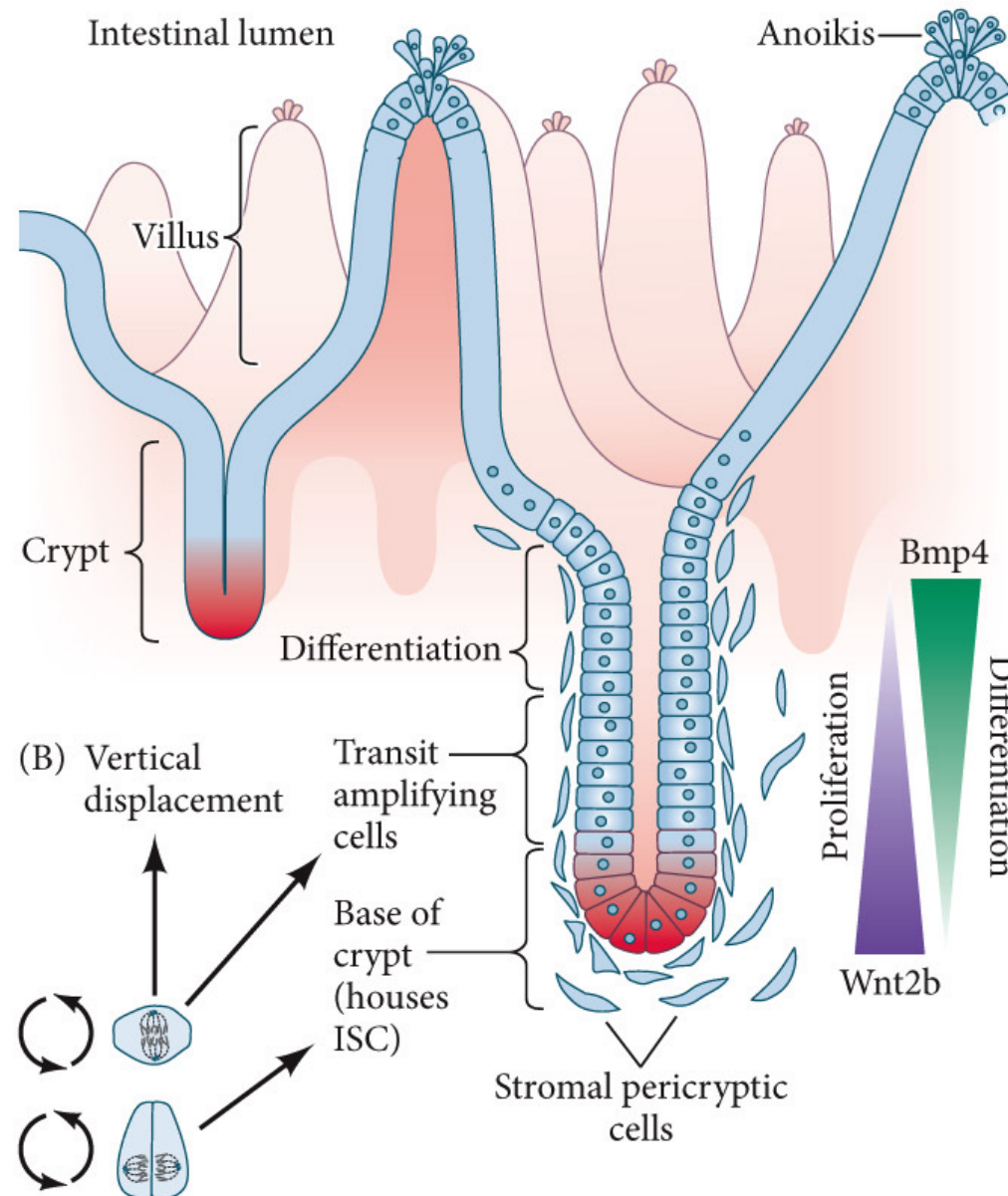


Nobel prize, 2012

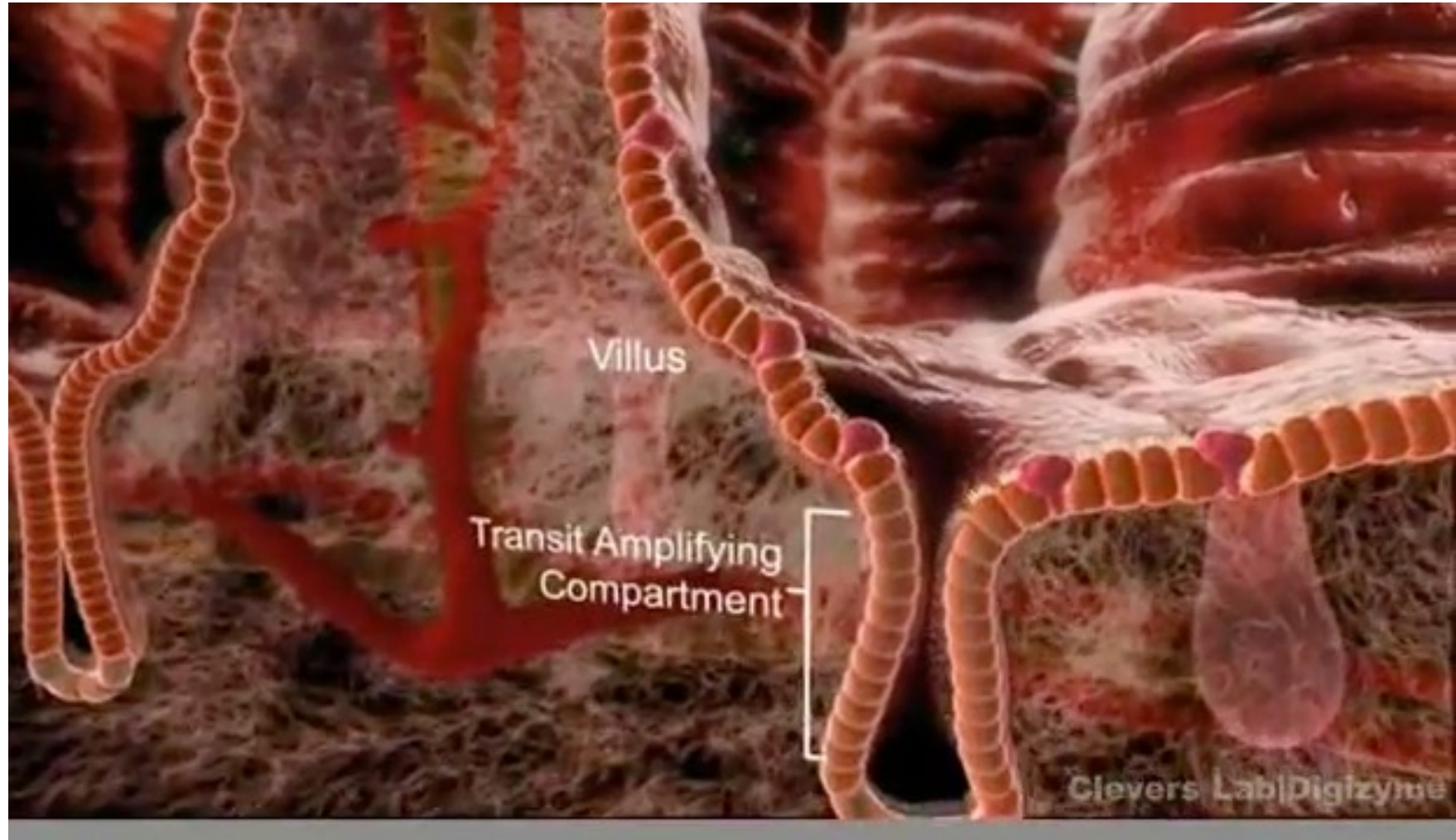


Generating different kinds of organoids

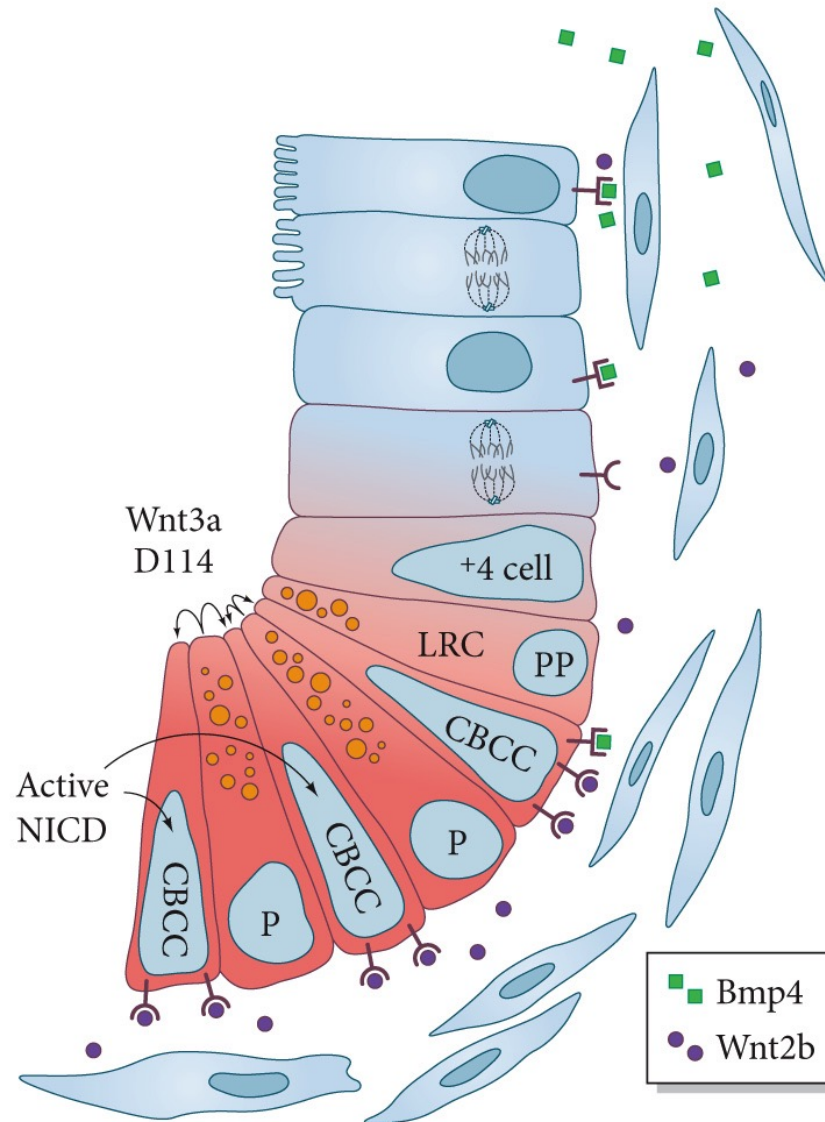
● Mammalian intestinal epithelium renewal



● Intestinal crypt dynamics: animation



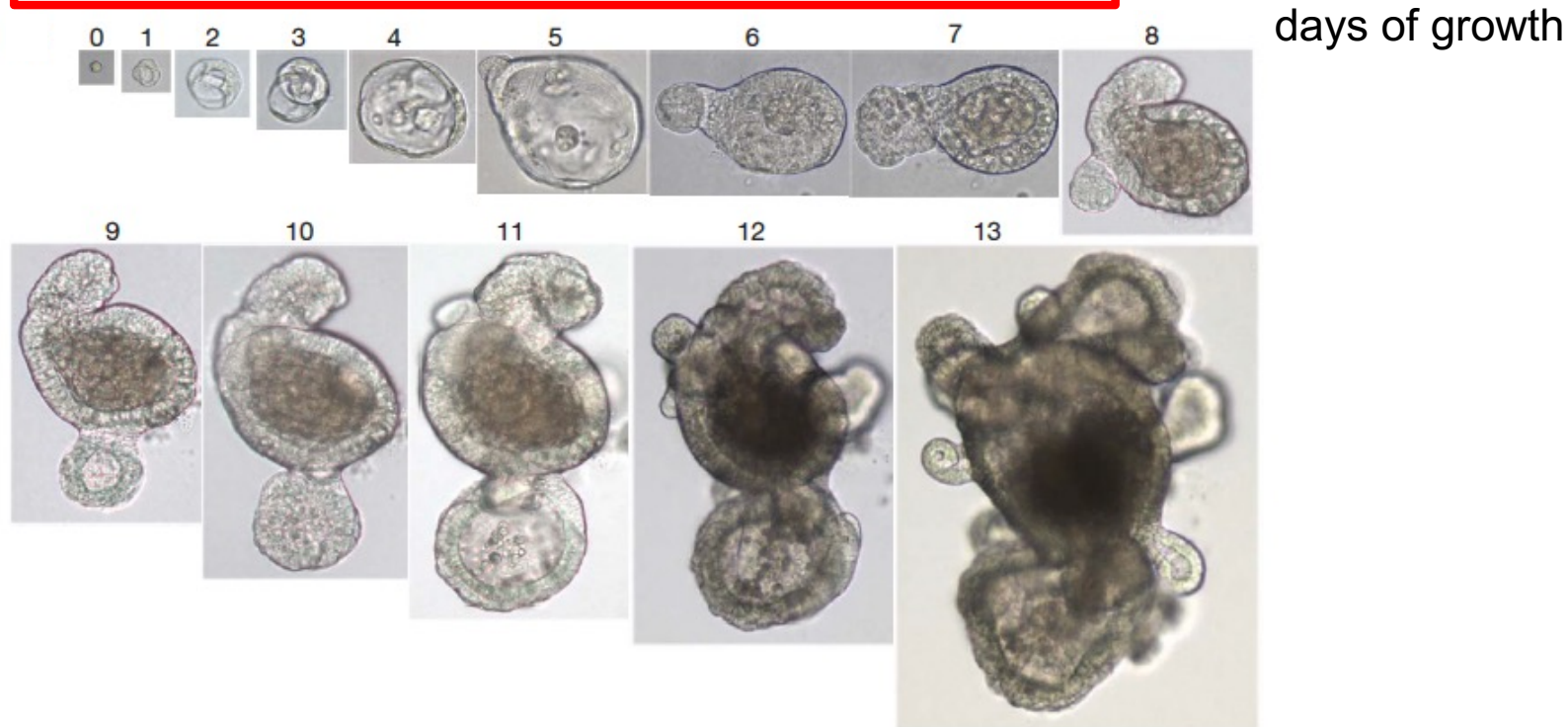
● The niche of intestinal stem cells



Intestinal stem cells in the crypt (called Crypt Basal Columnar Cells -CBCCs) are marked by expression of **LGR5** (Leucine-rich repeat-containing G-protein coupled receptor 5)

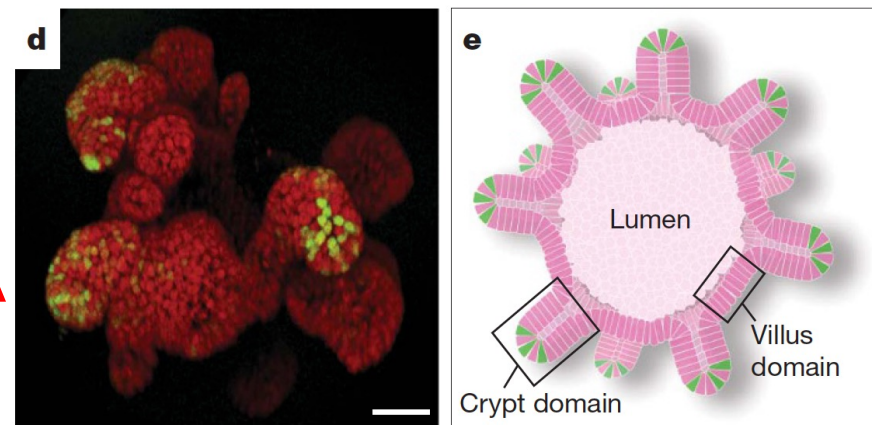
Using mESC cells to make mini-guts

Single Lgr5+ stem cells to start with



Amazing... but not fully organized

Lgr5
DNA



- **Engineering helps organize organoids**

● Paper

- Homeostatic mini-intestines through scaffold-guided organoid morphogenesis. *Nikolaev et al., Nature, 585: 574-578 (2020)*
- **As usual: only main figures are to be discussed!**

● Scaffolding organoid geometry



SCHOOL OF LIFE SCIENCES, INSTITUTE OF BIOENGINEERING
LABORATORY OF STEM CELL BIOENGINEERING

Homeostatic mini-intestines through scaffold-guided organoid morphogenesis

Supplementary Video 1:

Mini-gut tube development

Time-lapse video of representative mini-gut tube development
during the first 72 hours

Lausanne, 2020

● Questions?
