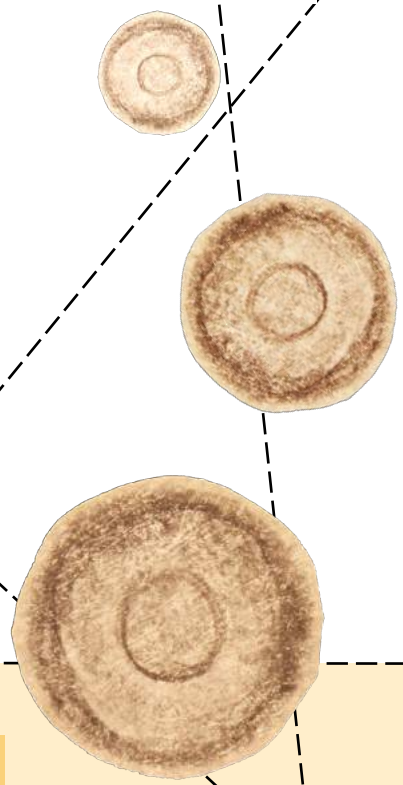
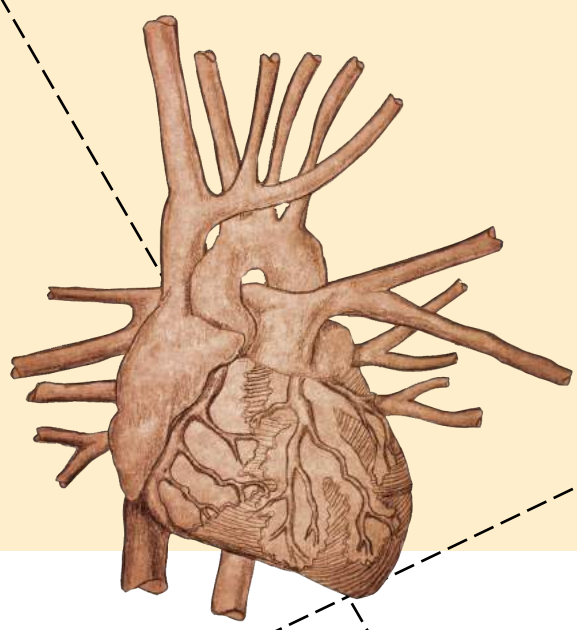
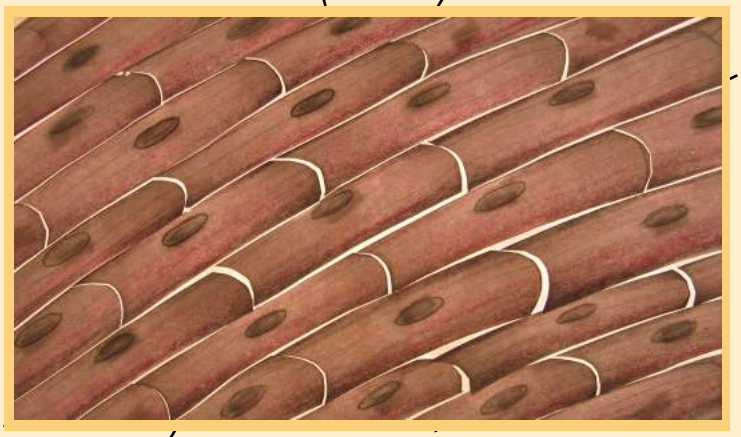
Unfolding Organogenesis

Organogenesis is the formation of organs and bodily tissues that occurs during the development of an organism. Like folding a sheet of paper into the shape of an organ, stem cells differentiate to form specialised organ cells during development. These differentiated cells arrange in the specific three-dimensional architecture of an organ, allowing it to perform its vital bodily functions. Researchers of developmental biology have long studied the mechanisms of organ design with the hope that a better understanding of these processes might increase medicine's ability to repair damaged tissues and intervene in devastating diseases.

Advances in stem cell science suggest that scientists might be able to replicate organogenesis in the laboratory to create bodily tissues and organs from stem cells. Using a technology called *induced pluripotency*, researchers restore the capacity of now specialised cells of patients to make different cells, tissues and organs. Like unravelling a sheet of paper from previous folds, induced pluripotency unfolds cells specially shaped for an organ by regulating their gene expression. This process enables researchers to repurpose cells from one organ to the next like the recycling of paper. Once the science is ready and clinical trials have been successful, this technology might find application to treat a wide range of health problems. A patient's cells, such as skin cells, could then be used to replace any other type of cell they might need.

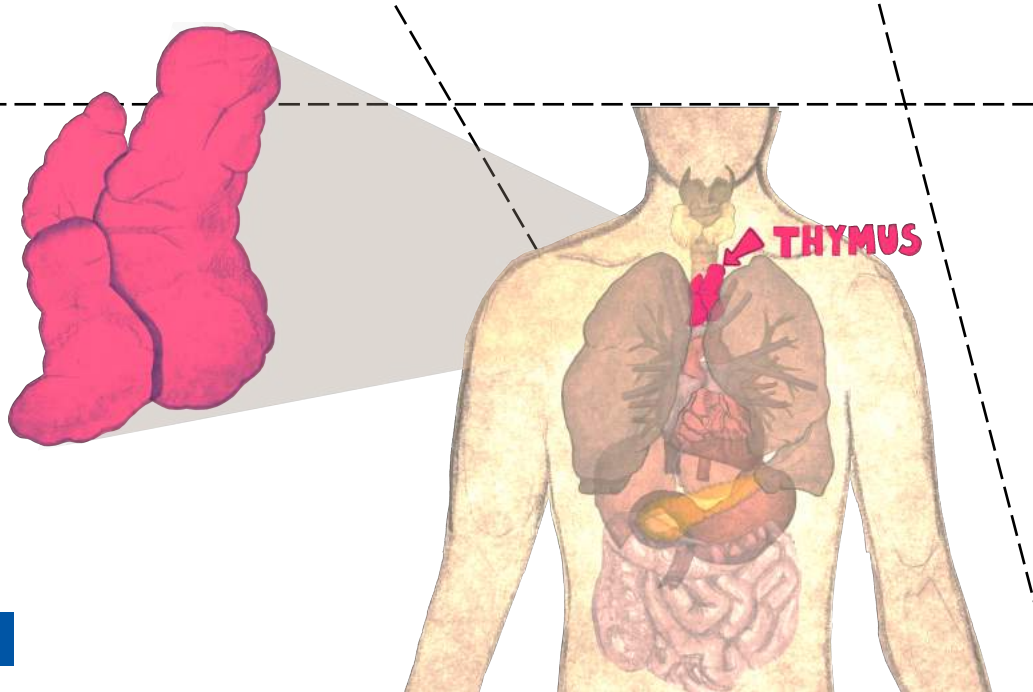






Although the induced pluripotency technique might inform the development of medical treatments eventually, the folding, unfolding and refolding of stem cells today still faces a number of challenges in laboratory practice. In labour-intensive experiments, scientists need to tease out gene expression patterns for organogenesis that, like origami instructions, will tell them how organs are made. Like paper, cells retain 'creases' of previous foldings and these interfere with scientists' ability to form them anew, requiring research to study those traces. These and many more challenges need to be addressed before laboratory-grown organs can go into clinical trials and be safely applied in medical treatments.

Nonetheless, laboratory-produced organoids (organ-like structures) already provide useful three-dimensional models for studying diseases and screening drugs in the petri dish. To make organoids, scientists sometimes use scaffolds made from bio-compatible materials to support the formation of three-dimensional organ architecture. Unfolding organogenesis invites everyone to explore the incredible three-dimensional plasticity of cells, tissues and organs, to participate in a conversation with scientists, and to fold origami together.



ThymiStem
EuroStemCell