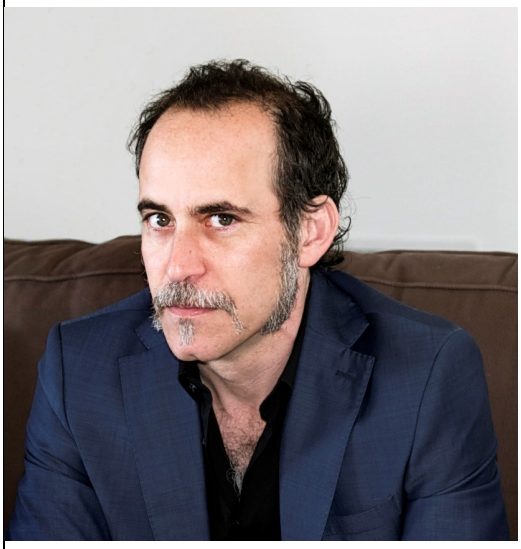
CDB Student Organized SEMINAR



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Wednesday, October 18, 2017
15:00～ C1F CDB Auditorium

Cellular Control of Time, Size and Shape during Development and Evolution

The ways in which anatomical size and shape are generated have intrigued scientists for centuries. Much research in this area has focused on allometry and heterochrony as mechanisms to explain species-specific transformations in size and shape. A unifying feature of both allometry and heterochrony pertains to the relationship of size and shape to the fundamental parameter of time, particularly in terms of total developmental time, differential rates of growth, and/or the relative timing of developmental events. However, the molecular and cellular mechanisms that unite time, size, and shape during ontogeny and phylogeny have remained unclear. To address this issue, we have been investigating how the jaw skeleton acquires its size and shape by using a unique avian chimeric transplantation system that exploits species-specific differences between Japanese quail and white Pekin duck. A powerful and serendipitous feature of this chimeric system is that quail embryos grow at a quicker rate than do duck (17 versus 28 days from fertilization to hatching). We exchange cranial neural crest mesenchyme (NCM), which is the progenitor population that forms the jaw skeleton, between quail and duck embryos. This causes faster-developing quail cells and relatively slower-maturing duck cells to interact with one another continuously and challenges resulting chimeras to integrate two distinct morphogenetic programs for size and shape. Having such divergent ontogenetic trajectories allows us to screen for species-specific changes to the timing of gene expression, cell differentiation, and tissue formation. We can then test directly if such changes in growth rates and the timing of developmental events affect size and shape. We have found that donor NCM controls time in the host and in so doing, implements stage-appropriate and species-appropriate size and shape simultaneously. Thus, NCM employs time-dependent molecular and cellular mechanisms to govern skeletal size and shape during development and evolution.

Host: Shinnosuke Higuchi, CDB Students Association (higuchi@cdb.riken.jp)