IN VIVO EYES DEVELOPMENT OF DROSOPHILA IN EMBRYONIC STAGE STUDIED BY 5D IMAGING VIA LIGHT SHEET MICROSCOPY

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Light sheet microscopy (LSM) has been a powerful and popular imaging platform especially for applications in developmental biology due to its remarkable advantages such as the fast acquisition speed, low photo-toxicity, low photo-damage and deep penetration depth [1]. We established a dual-illumination multi-channel light sheet microscope to study the eye-antenna disc primordium (EADP) formation of Drosophila in early embryonic stages, which has remained elusive for a long time due to the lack of solid evidence from in vivo live images [2]. The 5D (3D spatial, time-lapsed and multi-channel) images provided by LSM reveal the cell dynamics during the EADP formation. Furthermore, the engrailed (en) expression pattern was imaged and compared with that of CD, an enhancer of eye gone (eyg) [3], to clarify their contributions and correlations. Our cell tracking results also indicated that the progenitor cells, forming two lobes of EADP, were originated from separated regions on the preoral head segment and invaginated by following the head involution from embryonic stage 13.

![Fig. 1 (A) The 3D expression pattern of CD-GFP and en-RFP labeled on cell nucleus and the migration trajectory of the co-expressed cells on EADP from stage 12 to 15. (B) A close look of the 3D surface rendering of the fluorescence signals from 132 cell nucleus on EADP. (Green: CD⁺ cells; Red: en⁺ cells; Orange: en-CD co-expressed cells)](image)