1. Introduction: A fluorescent microscope is a useful tool to estimate intracellular ionic and/or molecular dynamics. However, most of fluorescent microscopes lack a cell tracking function. Therefore, a freely moving cell easily escapes from a scope and fluorescent observation is often finished.

2. Materials and Methods: To solve this problem, we developed a new fluorescent and tracking microscope system (Fig1. A). By using the developed system, we could observe emission lights to estimate intracellular dynamics, and we could simultaneously observe a transmission light to control an electrical XYZ stage for 3D single cell tracking [1].

3. Experimental Results: To evaluate a performance of the developed system, we demonstrated a continuous recording of intracellular Ca$^{2+}$ concentration in a freely moving Paramecium multimicronucleatum over 1.5 minute (Fig1. B). Indo-1 was used as a Ca$^{2+}$ indicator.

Figure1: (A) Schematic architecture of a fluorescent and tracking microscope system. (B) Time lapse of intracellular Ca$^{2+}$ concentration of a freely moving paramecium.