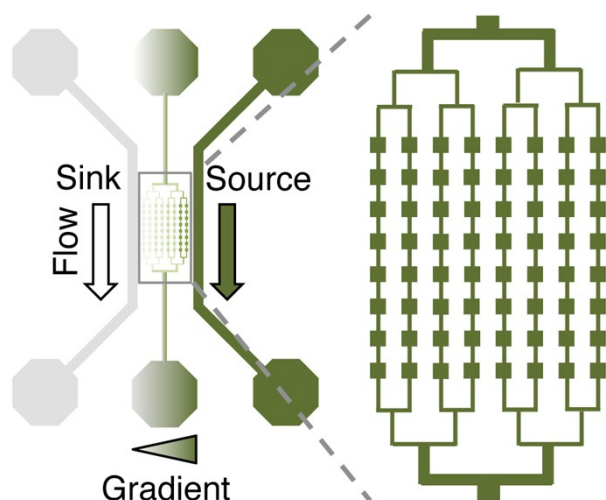
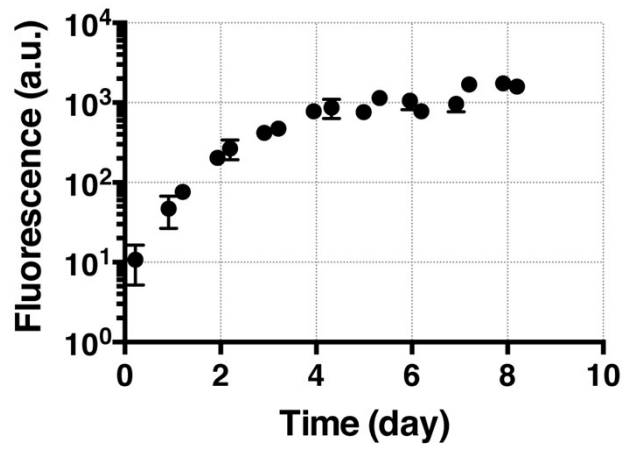


**Figure S1. Array design with interconnecting habitats facilitating injection cell seeding.** In the design shown, the array contains 64 microhabitats. Each individual habitat has a dimension of  $100\ \mu\text{m} \times 100\ \mu\text{m} \times 100\ \mu\text{m}$ , the gap between two adjacent habitats is of  $100\ \mu\text{m}$ , the interconnecting channel between the adjacent habitats has a width of  $40\ \mu\text{m}$  and length of  $100\ \mu\text{m}$ . Cells are introduced through the middle channel inlet.



**Figure S2. Baseline algae growth kinetics in test tubes.** Growth curves of *C.*

*reinhardtii* cells in minimal medium using batch culture system. The specific growth rate is  $1.47 \pm 0.18 \text{ day}^{-1}$ .



**Movie S1. Heterogeneity of *C. reinhardtii* cell motility and morphology.** The movie shows that *C. reinhardtii* cells stay either in single cell or clustered cell culture. In addition, the cell motility and morphology display a wide range of variations. This movie is taken on day 5 of the cell culture, using  $8 \times 8$  microhabitat array. The size of each microhabitat is  $100 \mu\text{m} \times 100 \mu\text{m} \times 100 \mu\text{m}$ , and the movie has 100 frames and the duration of the movie is 3 s.

