Supporting Information

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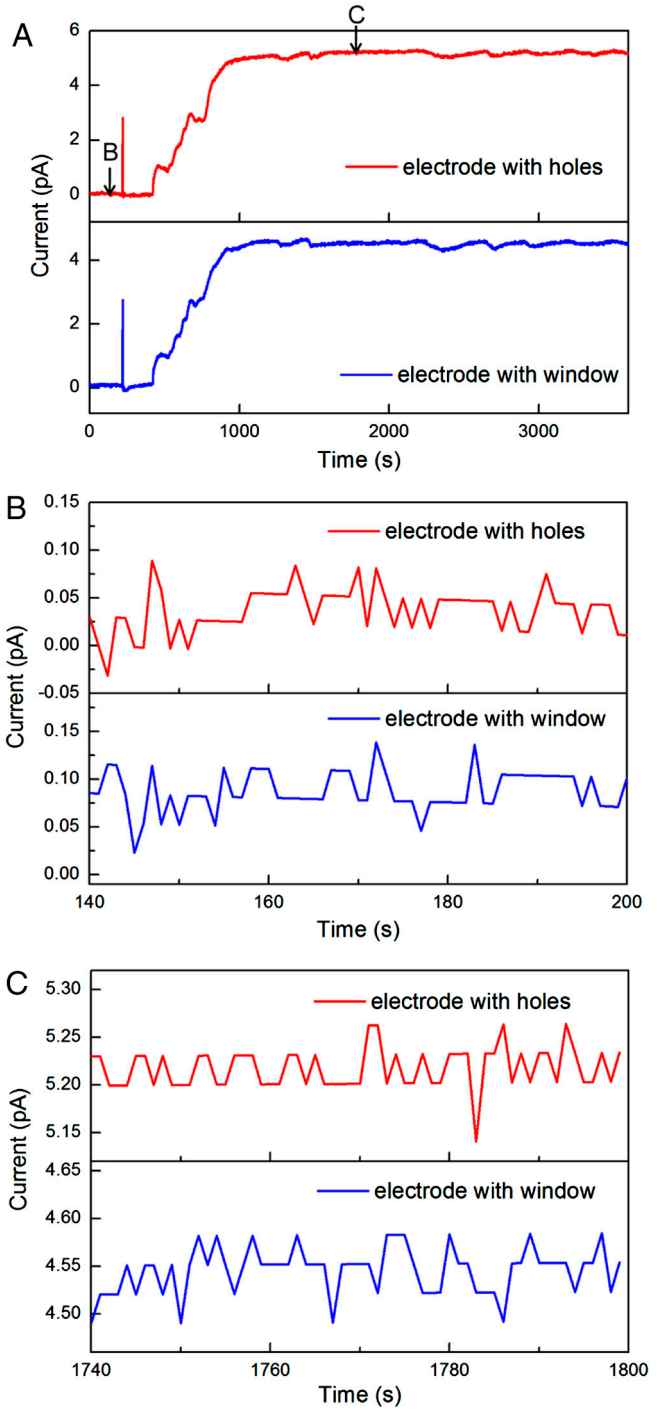


Fig. S1. Noise analysis for short-circuit current measurement in Fig. 2*A*. (*A*) Short-circuit current recording on two adjacent electrodes separated by 25 μm, with nanoholes (red) and window opening (blue). Data are the same as shown in Fig. 2*A*, with black arrows here marking the regions where the current noise was analyzed. (*B* and *C*) Comparison of the current noise from adjacent nanohole and window electrodes before (*B*) and after (*C*) cell addition. No correlation in noise patterns was observed for these two electrodes, with or without MR-1 cells in solution. These data combined with the voltammetry results in Fig. 1*F*, which showed that an adjacent but fully passivated electrode exhibited negligible current signal, demonstrate that there is no current cross-talk (signal or noise) between measured electrodes in our experiments.

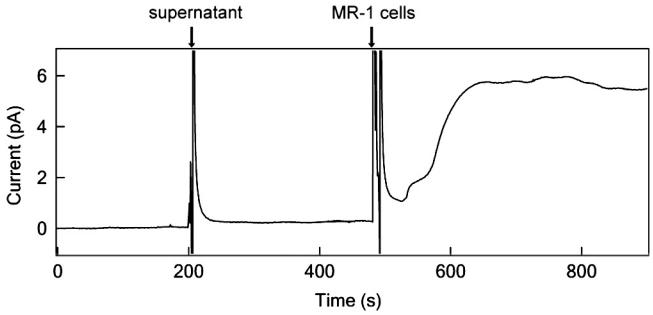
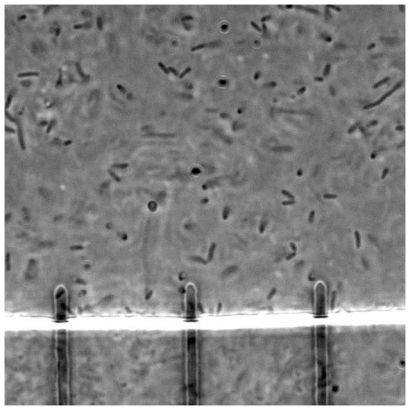
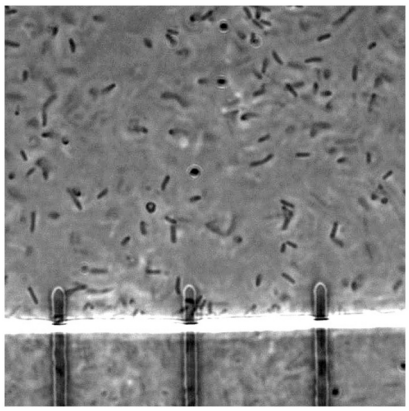


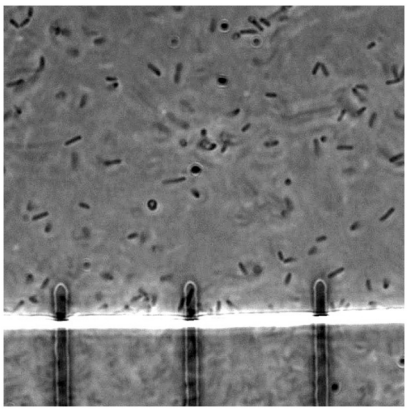
Fig. S2. Short-circuit current measurement on nanoelectrode when supernatant and *Shewanella oneidensis* MR-1 (MR-1) cells were added sequentially. The measured electrode (2 μm wide) has a 6 μm × 10 μm opening to yield a total exposed electrode area of ~12 μm^2. The baseline was recorded with minimal media (MM) only. The 18-h MR-1 culture in MM was centrifuged at 3,000 rpm for 5 min, and 0.5 mL supernatant was added to the measurement chamber at *ca.* 200 s (after recording the stable baseline). An immediate increase of current followed by a rapid drop to background level was observed within 30 s. Subsequently, when 0.5 mL of culture containing MR-1 cells was injected (at *ca.* 480 s) the current increased steadily after the initial spike, and saturated at ~5 pA. These results indicate that supernatant or mediators alone cannot produce sustained currents, and moreover, that living MR-1 cells are required for the persistent current output observed in Fig. 2*A*.



Movie S1. Real-time phase-contrast microscopy videos of *Shewanella* MR-1 cells recorded at position of the electrode used to record data in Fig. 5*A*. The videos were recorded before (Movie S1), during (Movie S2), and after (Movie S3) the sharp current dip occurring at ca. 22 min.
Movie S1 (WMV)



Movie S2. Real-time phase-contrast microscopy videos of *Shewanella* MR-1 cells recorded at position of the electrode used to record data in Fig. 5*A*. The videos were recorded before (Movie S1), during (Movie S2), and after (Movie S3) the sharp current dip occurring at ca. 22 min.
Movie S2 (WMV)



Movie S3. Real-time phase-contrast microscopy videos of *Shewanella* MR-1 cells recorded at position of the electrode used to record data in Fig. 5*A*. The videos were recorded before (Movie S1), during (Movie S2), and after (Movie S3) the sharp current dip occurring at ca. 22 min.
Movie S3 (WMV)