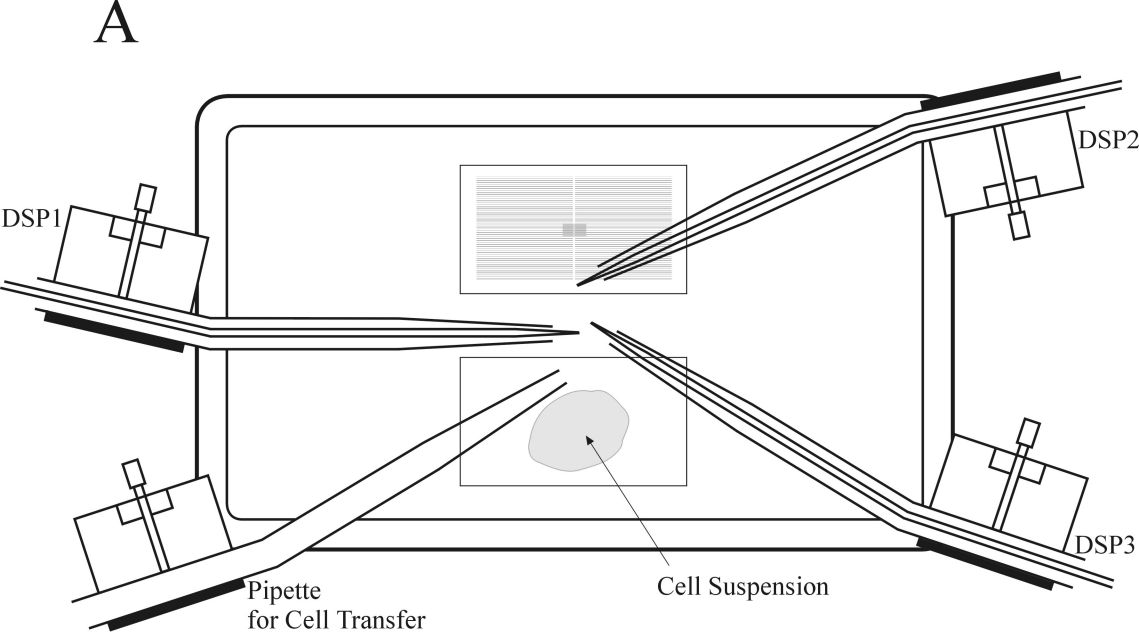
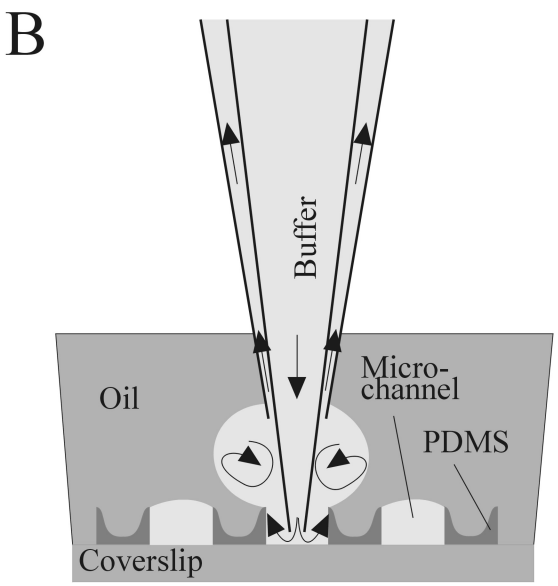

A
DSP1
DSP2
DSP3
Pipette
for Cell Transfer
Cell Suspension


B
Buffer
Oil
Micro-
channel
PDMS
Coverslip

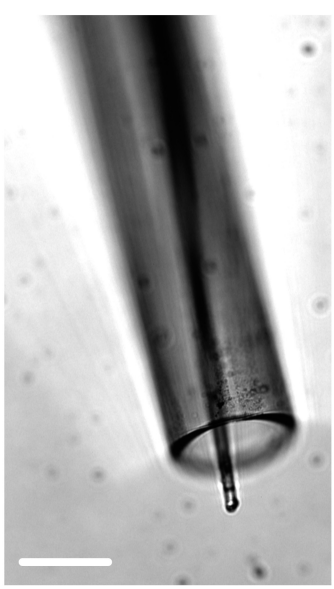

C

Figure 1

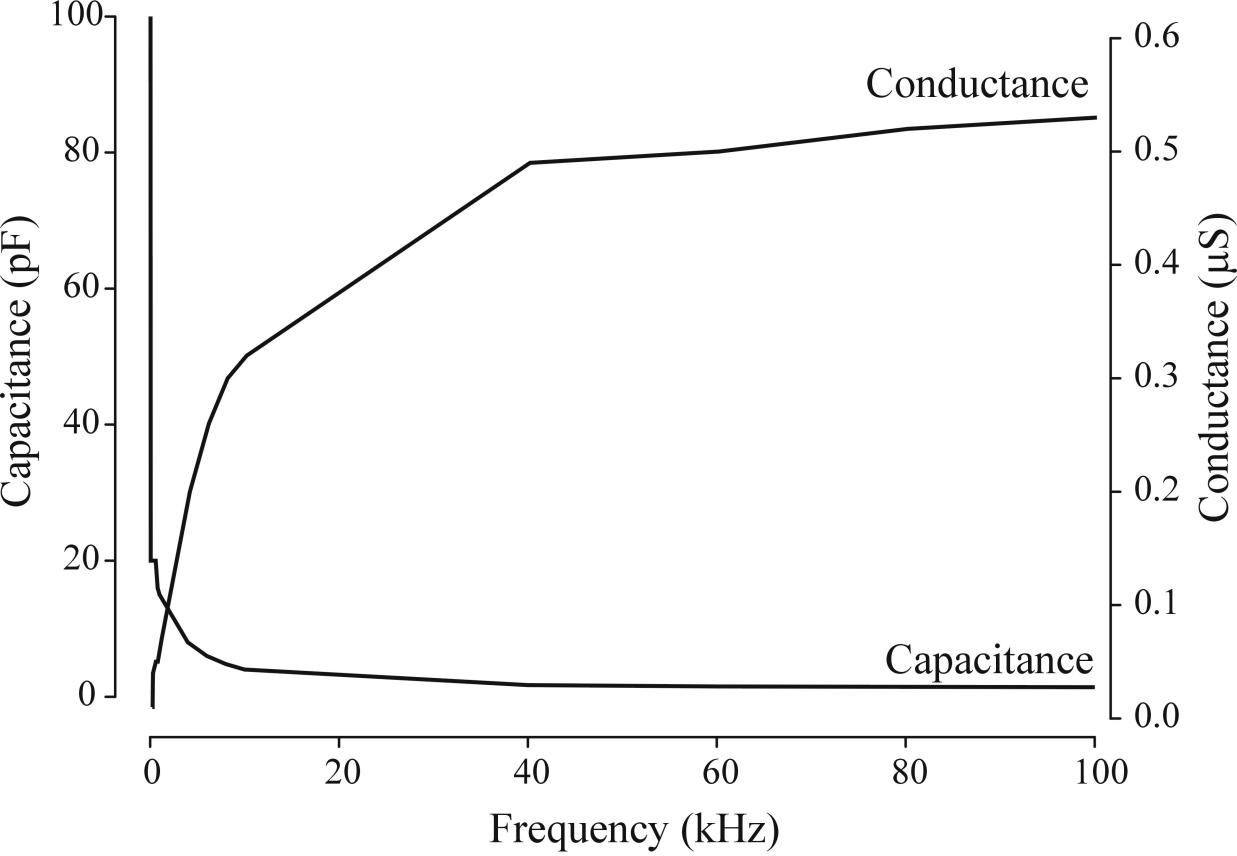

Capacitance (pF)
Conductance (µS)
Conductance
Capacitance
Frequency (kHz)
0
20
40
60
80
100
0.0
0.1
0.2
0.3
0.4
0.5
0.6

Figure 2

Fig. 1: (A) Scheme of the arrangement of the cell positioning pipette and the dual superfusion pipettes (DSP1- DSP3). The rectangle frame provided the support for the printed circuit board (PCB) with two rectangle windows, the top one for the glass chip with the microchannel/microelectrode arrayand the bottom one for the coverslip with the cell suspension. The assembly was then mounted onto the xy stage of the inverted microscope. (B) Scheme showing a cross section of the microchannel array with a dual superfusion pipette inserted into one of the channels. The outer pipette served to remove the spill produced through the pressurised inner pipette. (C) Micrograph of the tip of the dual superfusion pipette. Bar = 20 µm.

Fig. 2: Plot of the capacitance and conductance versus frequency of a longitundinal cell pair.

Video 1
This video shows a single cardiac myocyte laid across the oil gap between a pair of stimulating electrodes (black lines). The video captured the removal of the pipette in the left pool and the increase of the fluid level in the right pool. The opening of the two pipettes was positioned ~ 50 µm from the cell end.

Video 2
This video shows a single cardiac myocyte displaying Ca^{2+} waves at ~ 1.0Hz frequency. The cell developed Ca^{2+} overload during continuous electrical stimulation which was then stopped to record the Ca^{2+} waves spontaneously arising in the right cell end.

Video 3
This video shows three consecutive Ca^{2+} transients in the right cell of the end-to-end pair which was electrically stimulated at 0.5 Hz. The left cell did not respond to the stimulation but after the second stimulation it displayed a propagating Ca^{2+} wave which was triggered through a "Ca^{2+} spritz" entering through the intercalated disk from the neighbouring cell.

Video 4
This video shows the regional application of caffeine (10 mM) to the left cell of the end-to-end pair. The cell responded with a Ca^{2+} wave propagating towards the oil gap enclosing the intercalated disk. The Ca^{2+} wave was traversing the cell connection but paused at the right end of the oil gap for ~1s until the Ca^{2+} overload in the oil gap triggered a Ca^{2+} wave in the right cell.

Video 5

This video shows a Ca^{2+} wave in the right cell of an end-to-end pair. Note the attenuation and subsequent disappearance of the wave when it hits the intercalated disk.