



# WEARPLEX Gamma Workshop: Screen printed OEECTs and OEECT-based logic circuits



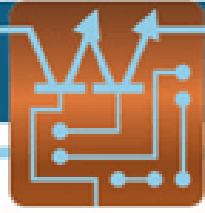
## Speaker: Peter Andersson Ersman

*Yusuf Mulla, Lars Herlogsson, Kathrin Hübscher, Jan Strandberg, Jessica Åhlin, Marie Nilsson, Naveed ul Hassan Alvi*

***RISE Research Institutes of Sweden***

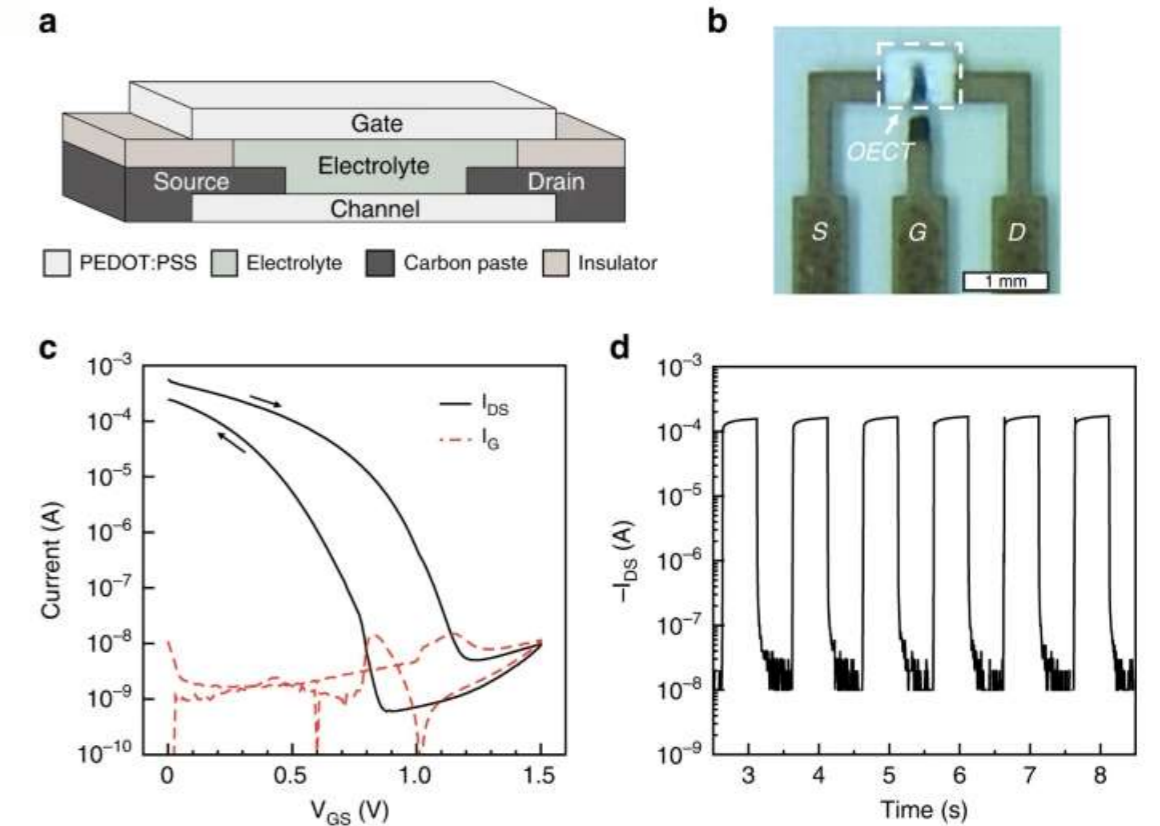
17<sup>th</sup> February 2022



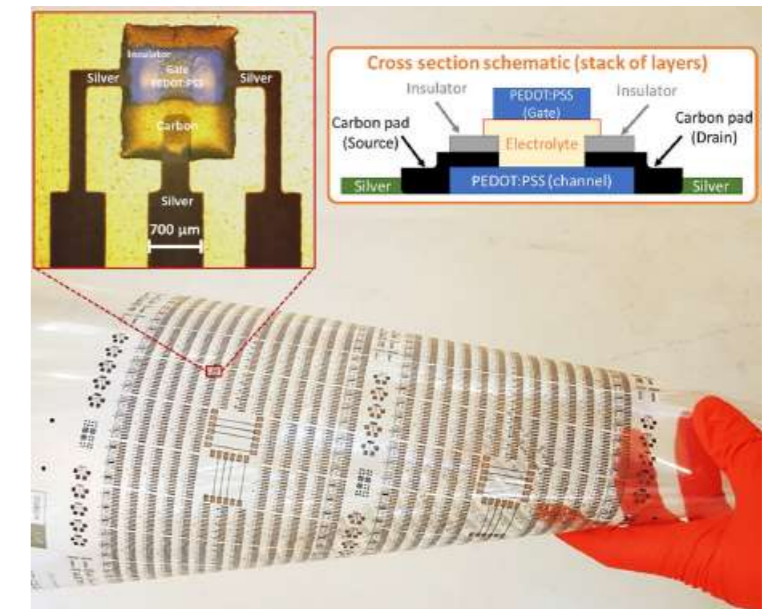


# Introduction

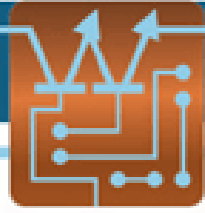
- » Organic electrochemical transistors (OECT)
- » Low-voltage operation ( $\sim 1$  V)
- » High current throughput
- » Scalable manufacturing, e.g., screen printing
- » Flexible substrates (plastic, paper, textile)
- » Promising in many application areas:
  - » Logic circuits for addressing
  - » Recording (EMG)
  - » Functional Electrical Stimulation (FES)
  - » Sensors, e.g., in stretchable electronics



*Nature Communications*, **10**, 5053 (2019)

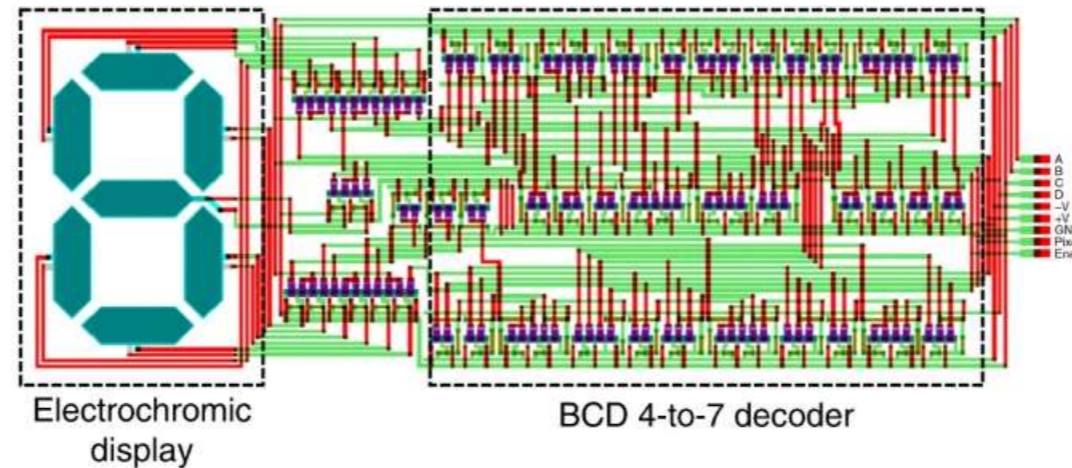
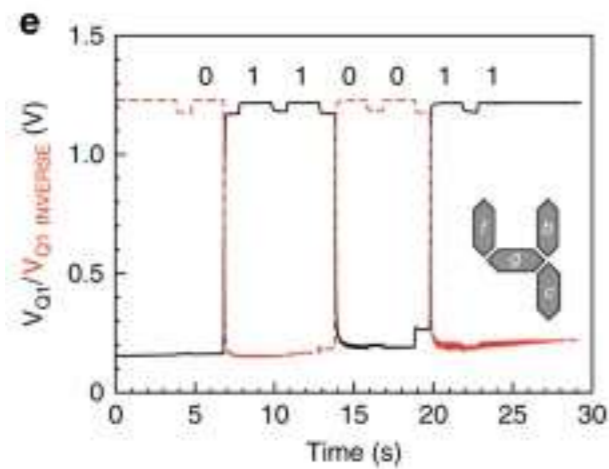
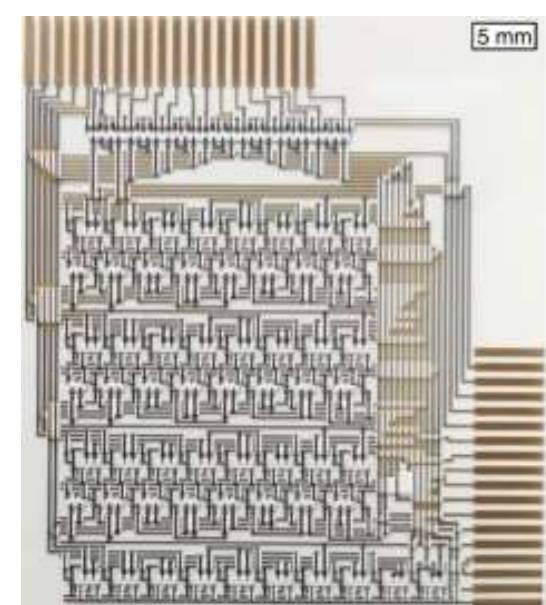
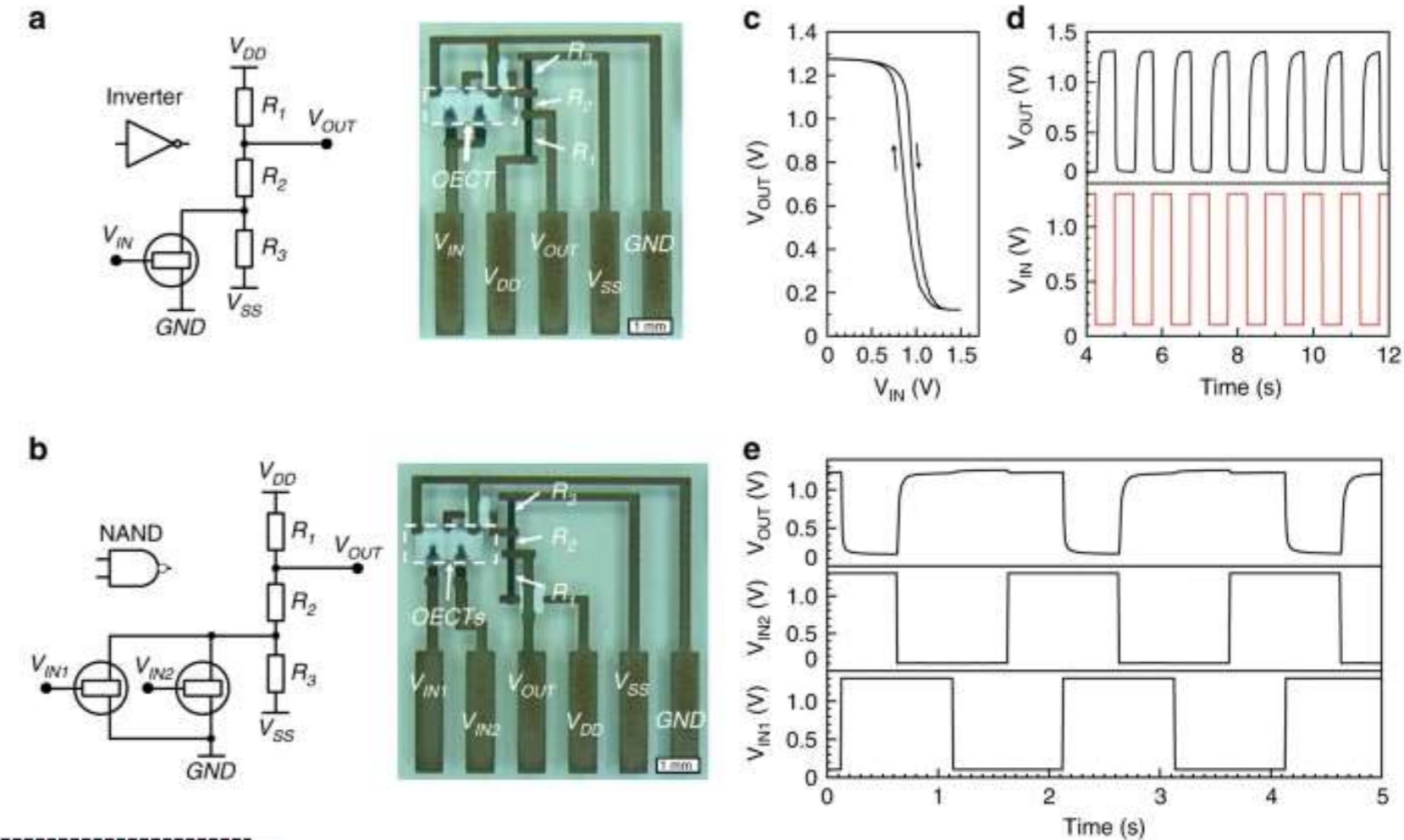


*npj Flexible Electronics*, **4**, 15 (2020)

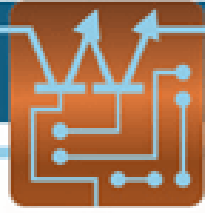


# Screen printed OECT-based logic circuits

- » Simple logic circuits for addressability
- » Possible to integrate into complex circuitry
- » Monolithic integration with peripheral devices
- » Compatible with large loads, e.g., displays
- » Decoders and shift registers

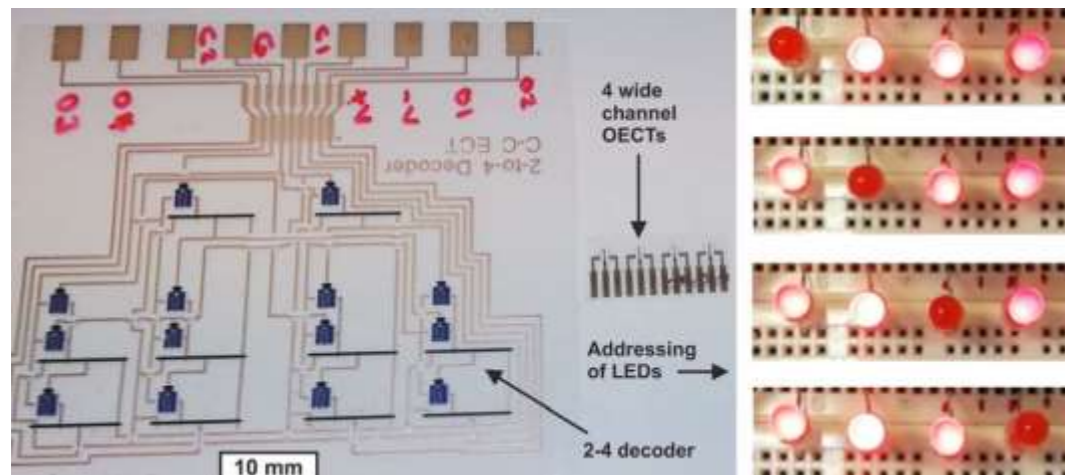
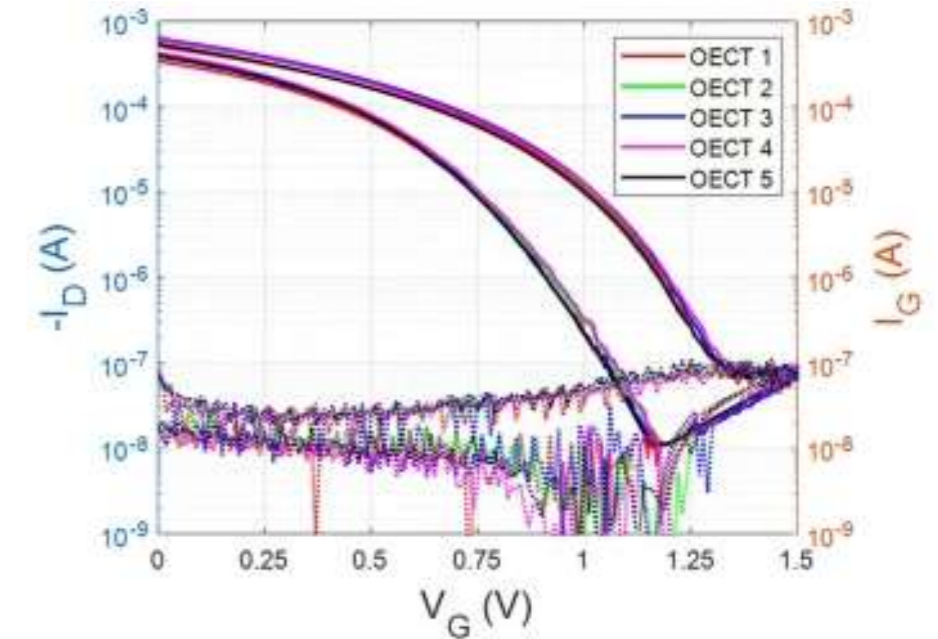


*Nature Communications* **10**, 5053 (2019)

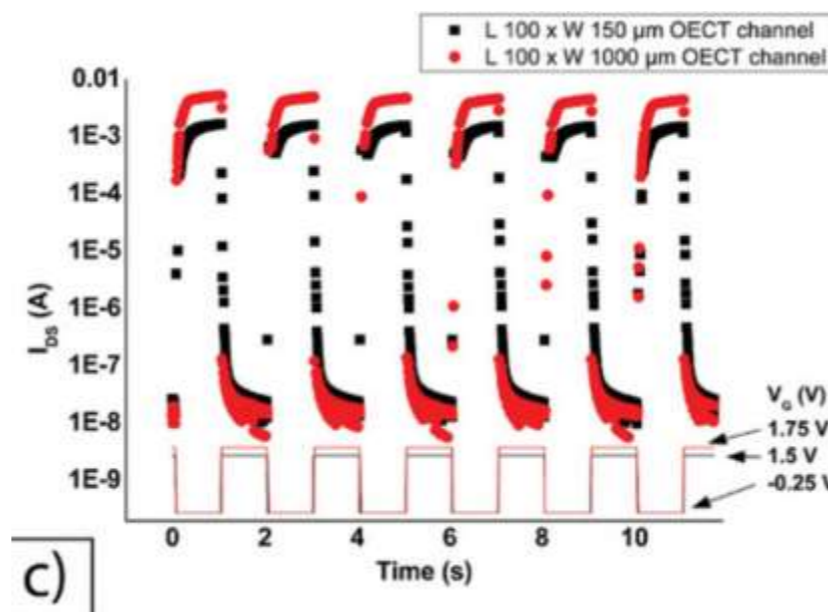


# Screen printed OECT-based logic circuits

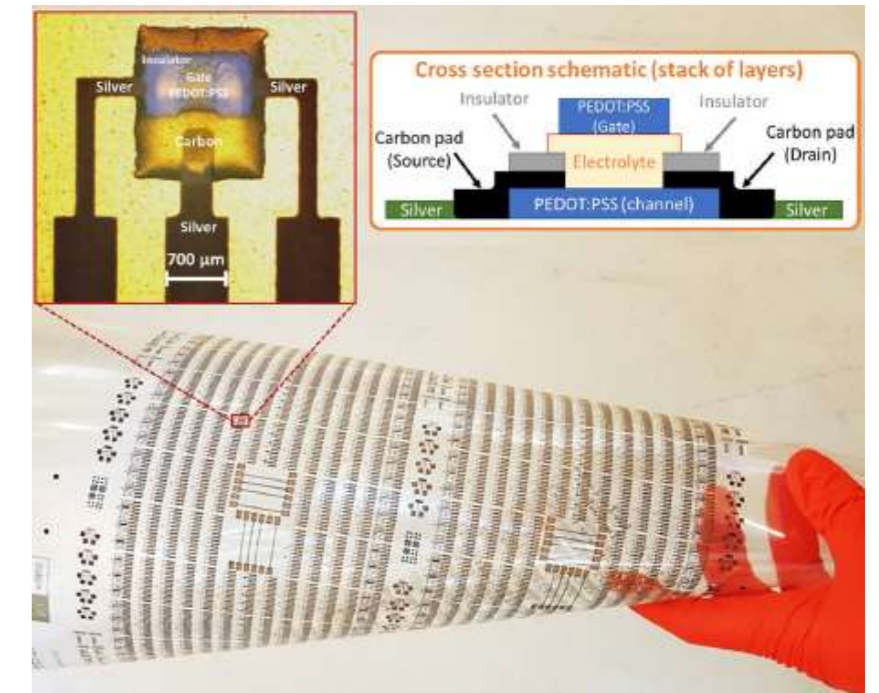
- » Reproducible switching performance
- » High manufacturing yield
- » 758/760 OECTs in one sheet operational (99.7 %)
- » Addressability and high current throughput
- » Novel process: approaching 100 mA



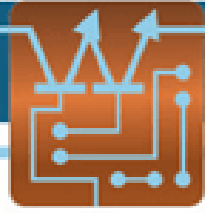
*Flexible and Printed Electronics*,  
5, 024001 (2020)



*Advanced Materials Technologies*,  
2101665 (2022)



*npj Flexible Electronics*, 4, 15 (2020)



# Applications within WEARPLEX

- » The target is to develop printed OECT-based circuits that can be integrated into the multi-pad electrodes, to simplify addressing by minimizing the number of wires
- » The printed circuits should preferably work 'in both directions', i.e., in both recording and stimulation applications, to enable multi-purpose usage
- » Upper: 8-bit shift registers for stimulation (FES) applications
- » Lower: 8-channel multiplexers for recording (EMG) applications

