

# #SMARTer Together

## Webinar Series



#SMARTer Together, May 7, 2020



# Soft Wearable Bioelectronics for Smart and Connected First Responders

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# Yeo Group @ Georgia Tech

*soft materials, machine  
learning, and flexible electronics*





# Soft Material-Enabled Electronics



# New Project: Smart & Connected First Responders

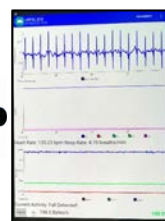


Emergency  
accident  
natural disaster  
terrorism



All-in-one, Soft  
Electronics like  
Band-Aid

Heart activities  
Respiratory rate  
Temperature  
Blood oxygen saturation  
Stress levels  
Activity levels



Carry-on  
smart device



Real-time  
detection of  
abnormal signals



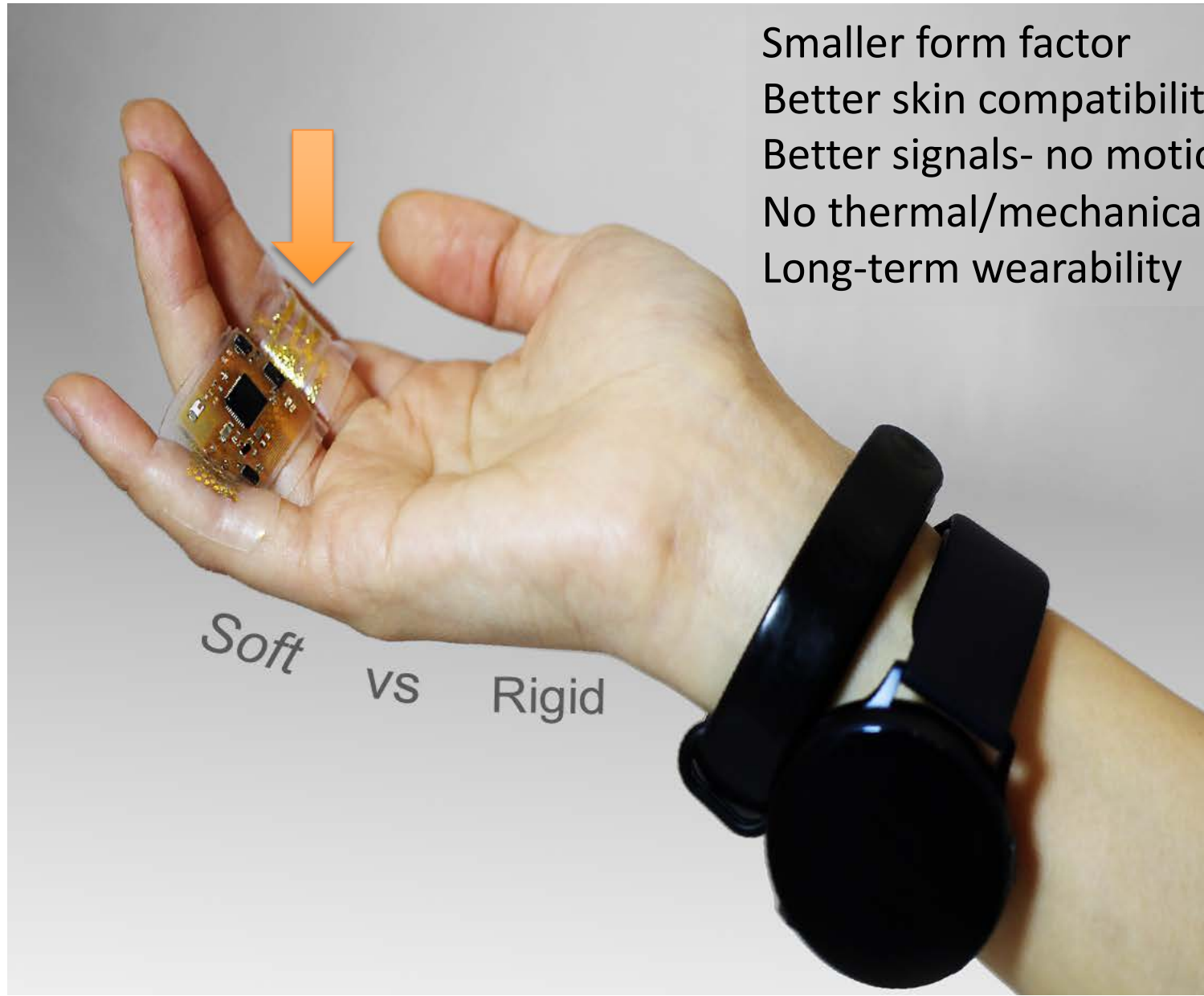
EMS



Local  
station



# Innovation of Soft Electronics



- Smaller form factor
- Better skin compatibility
- Better signals- no motion artifact
- No thermal/mechanical burden
- Long-term wearability

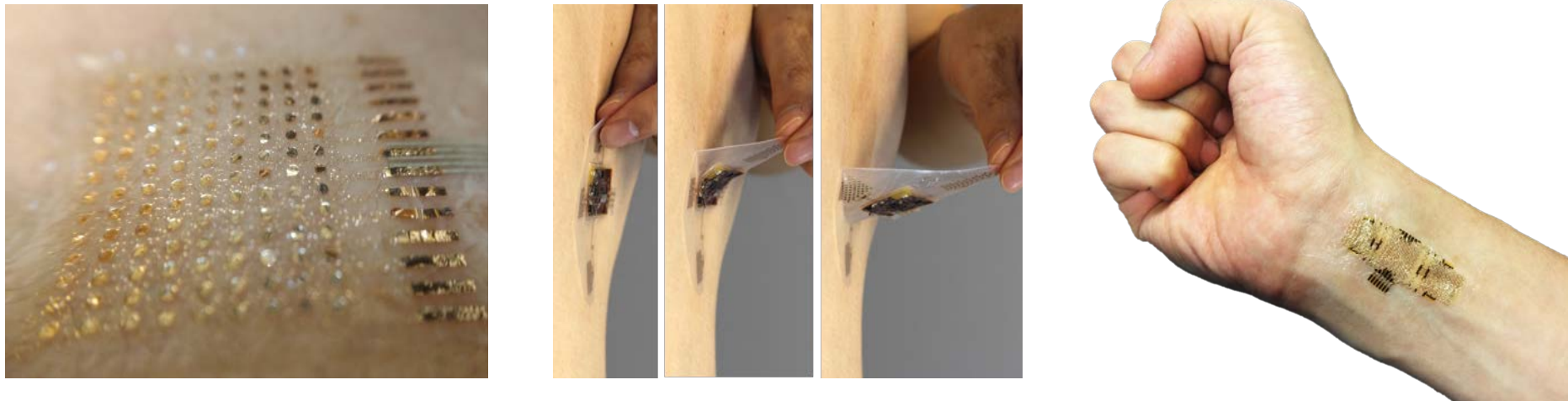
Soft vs Rigid

# Innovation of Soft Electronics

## Existing Electronics: Rigid and Bulky



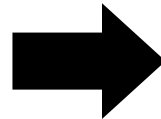
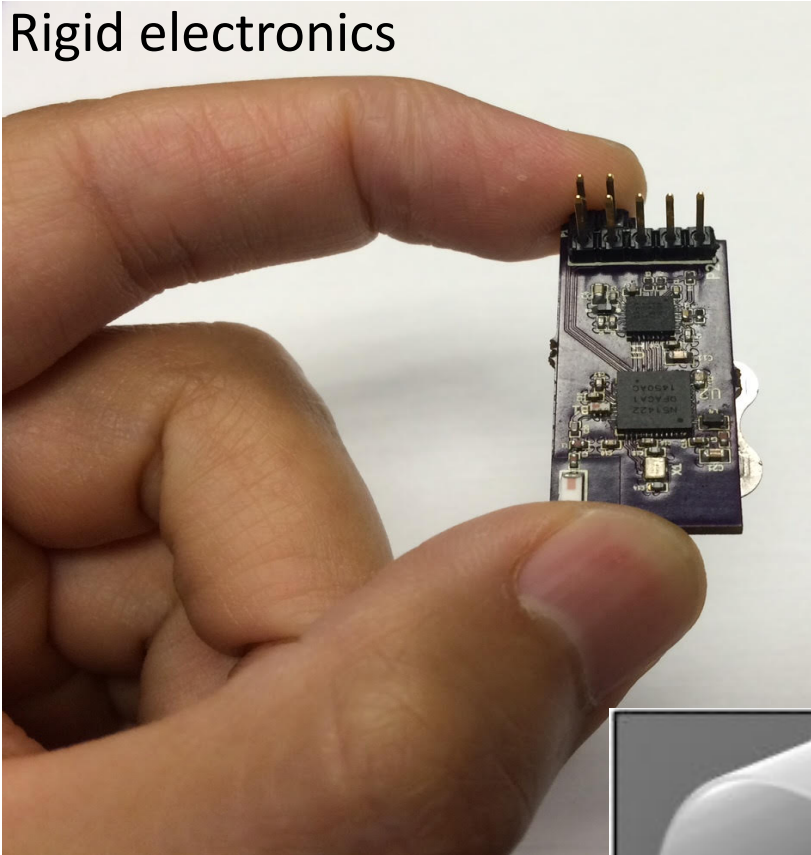
## Soft Electronics: Ultrathin and Flexible – soft, nanomaterials



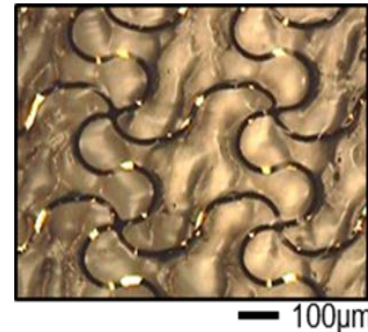
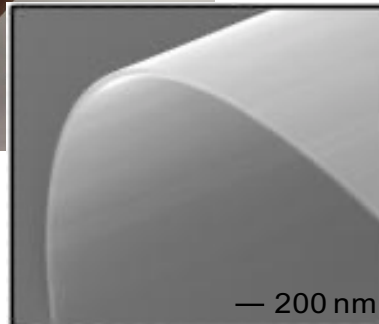
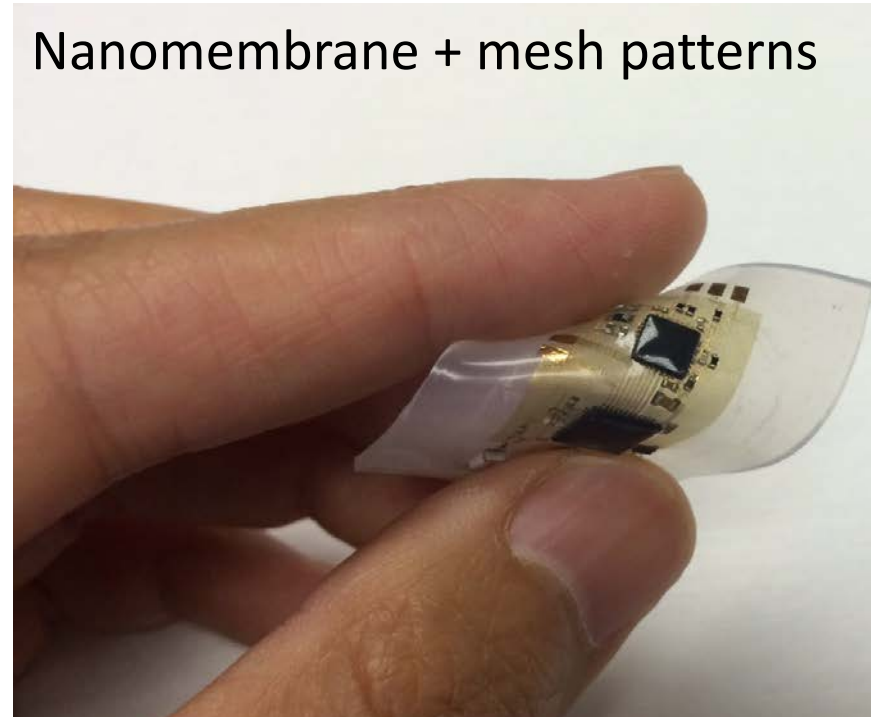
# Simple Idea – Design of Soft Electronics

**Q) How to make it thin, flexible, and light?**

Rigid electronics

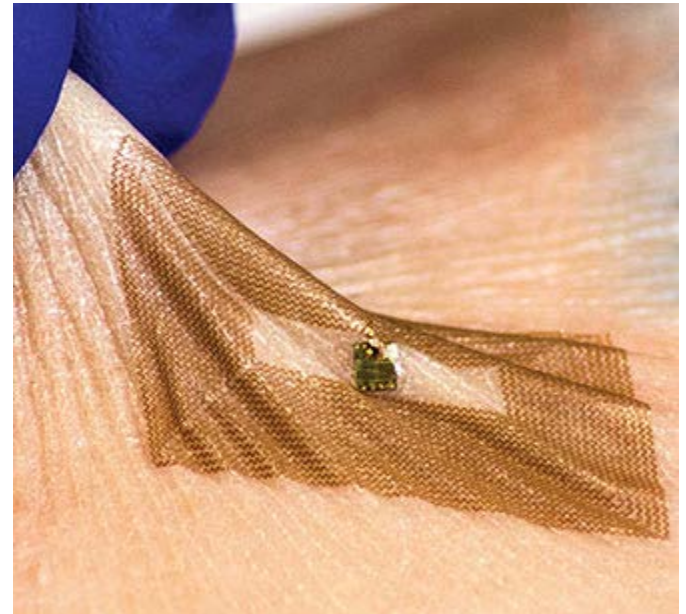
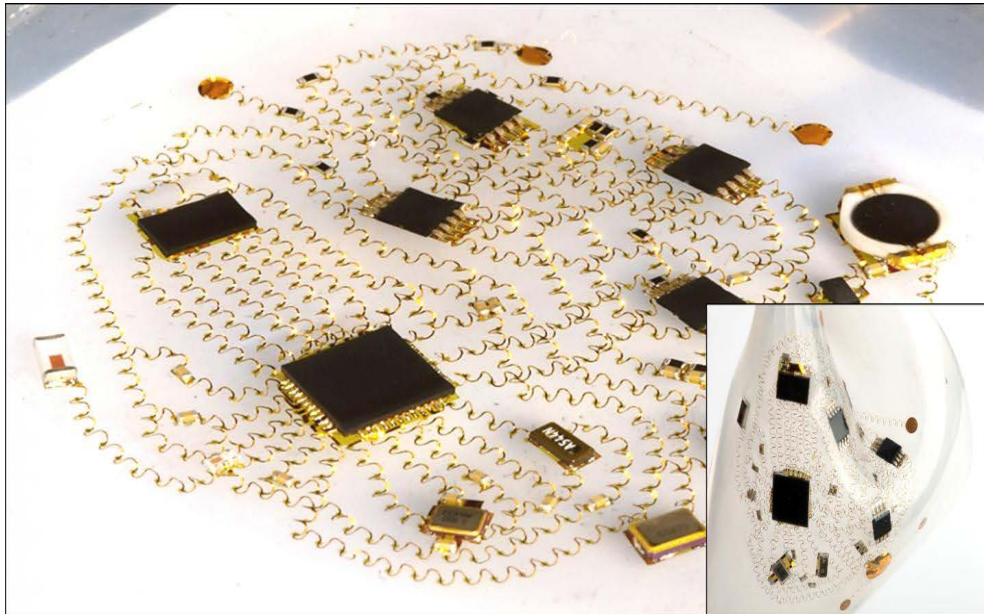


Nanomembrane + mesh patterns





# Soft Material-Enabled Electronics

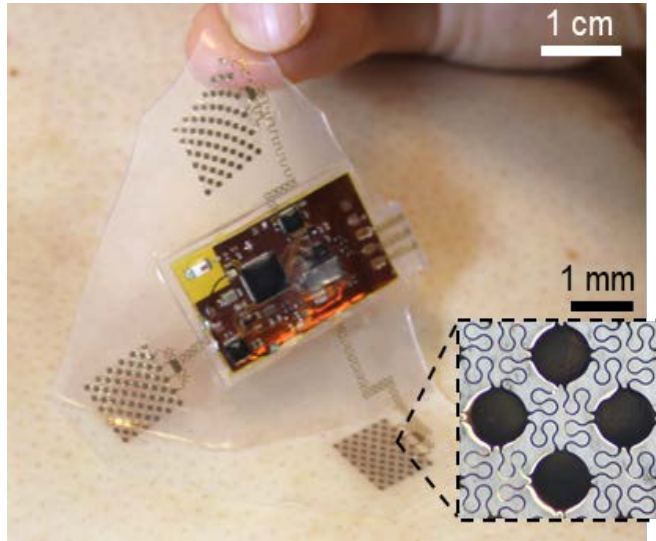


## *Examples*

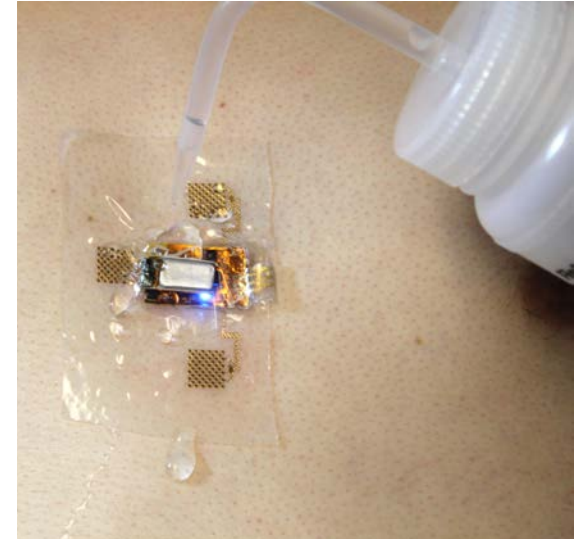
**Use Wearable Soft Electronics to  
Measure Biosignals on the Skin**



# Soft Biopatch on the Chest



Mounted  
on chest

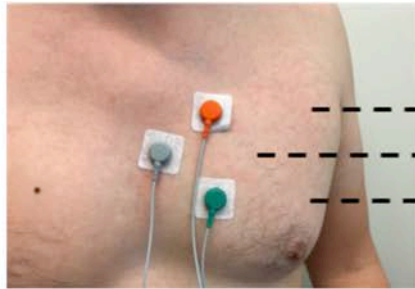


*Zoom-in view on the skin*

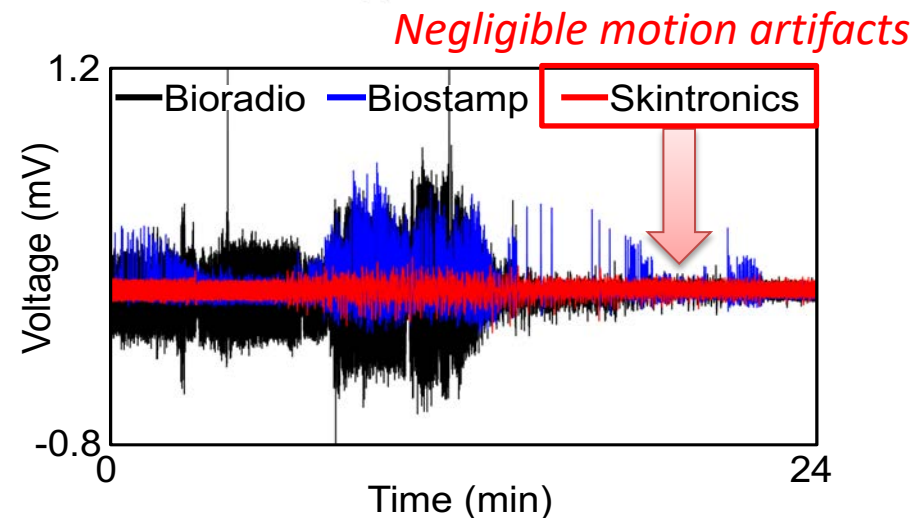
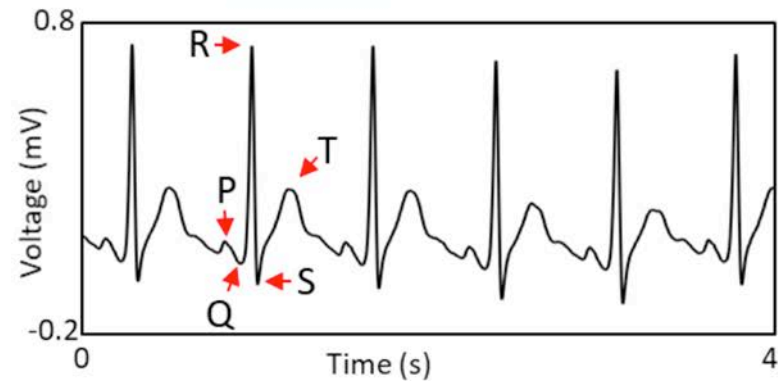
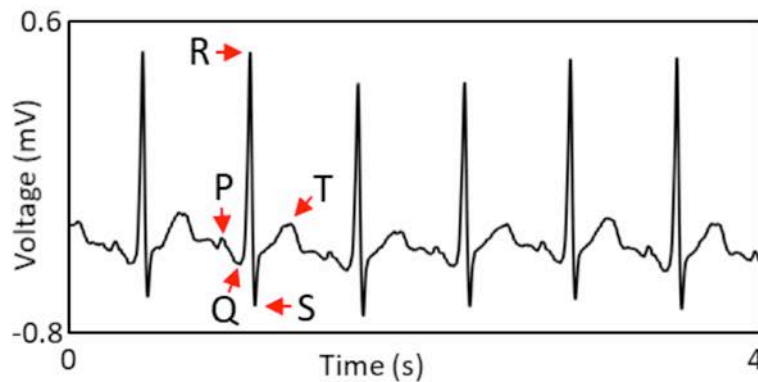
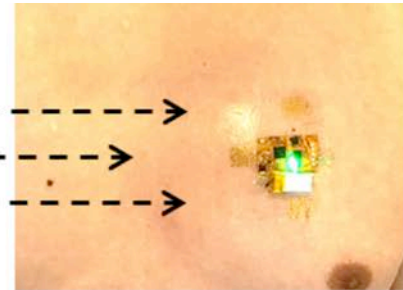


# Soft Biopatch on the Chest

Conventional  
Electronics

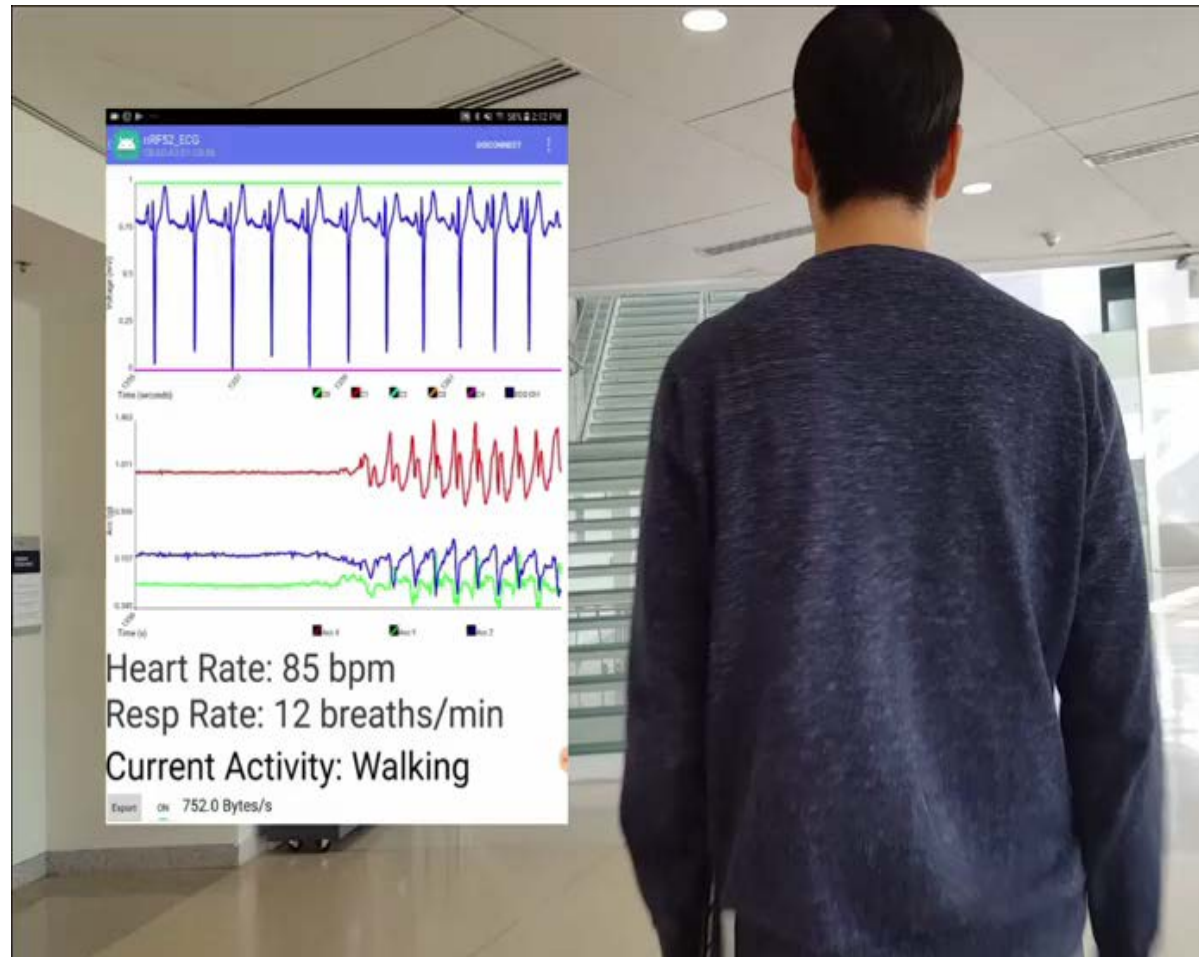
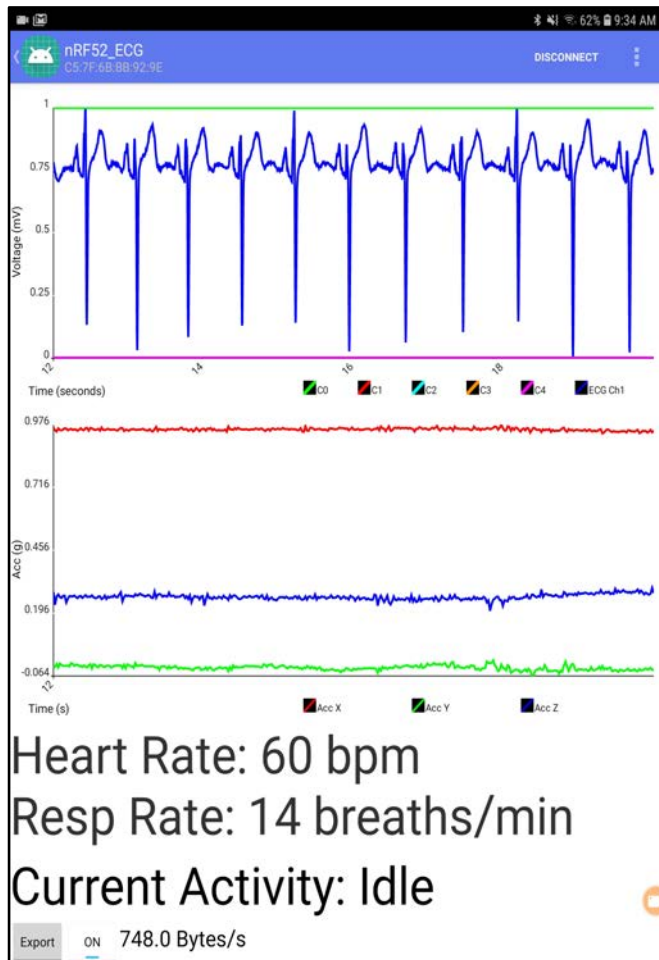


Skin-like  
Electronics  
(Skintronics)

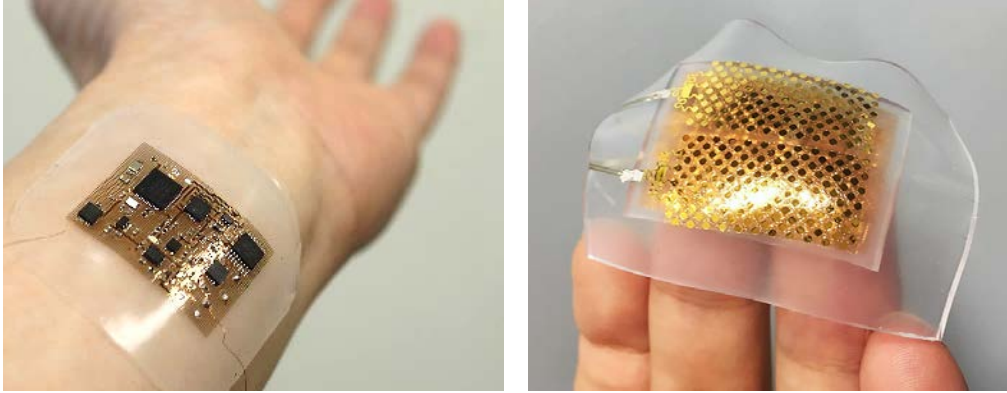




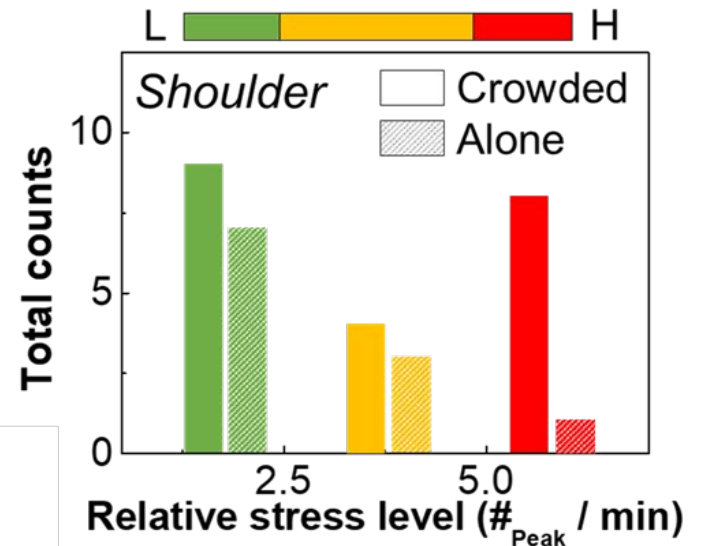
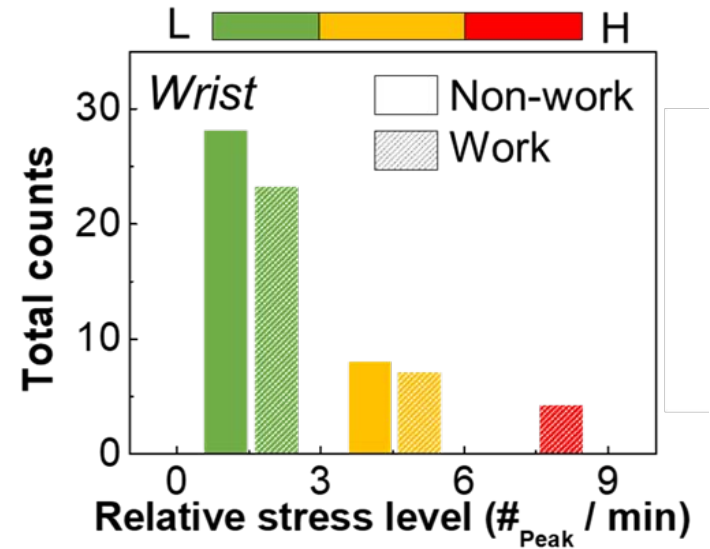
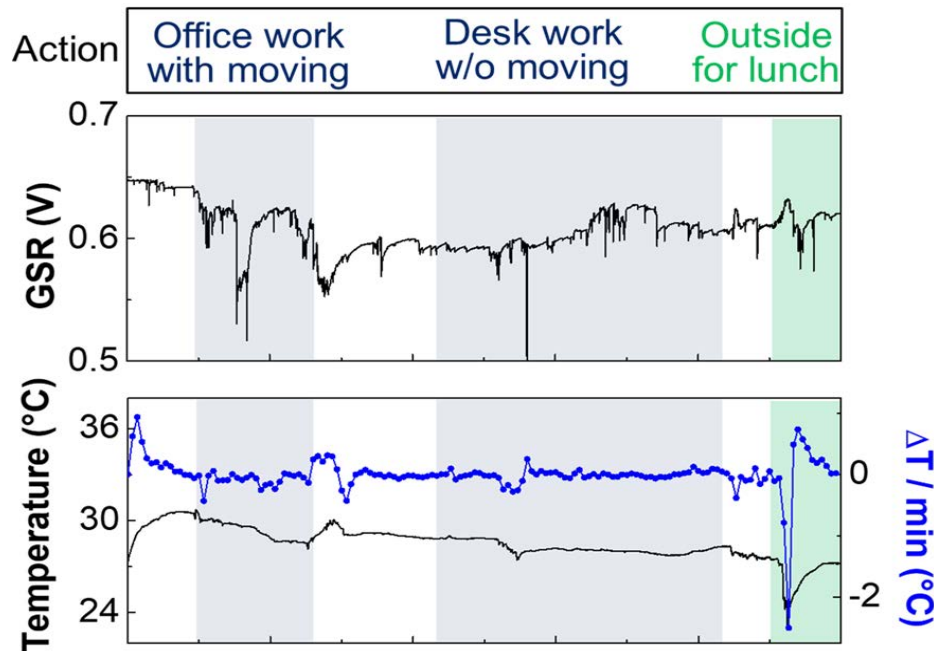
# Monitoring of Cardiac Signals and Activity



# Monitoring of Stress and Temperature



## *Sweat gland activity – emotional arousal*

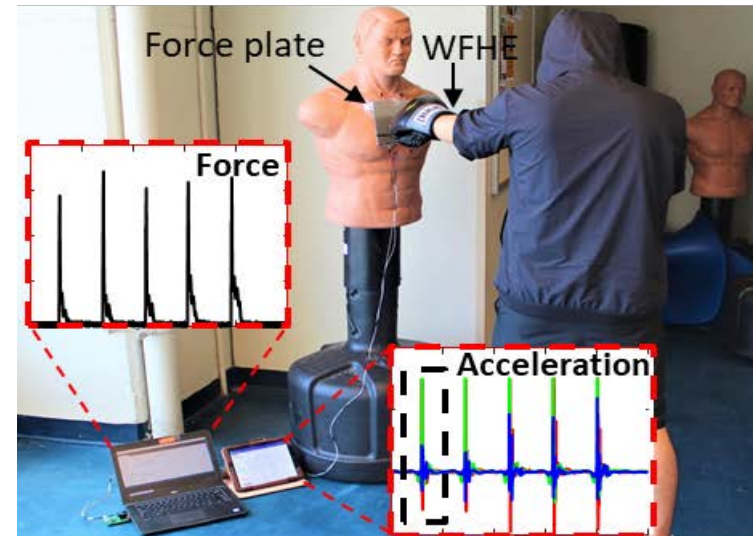
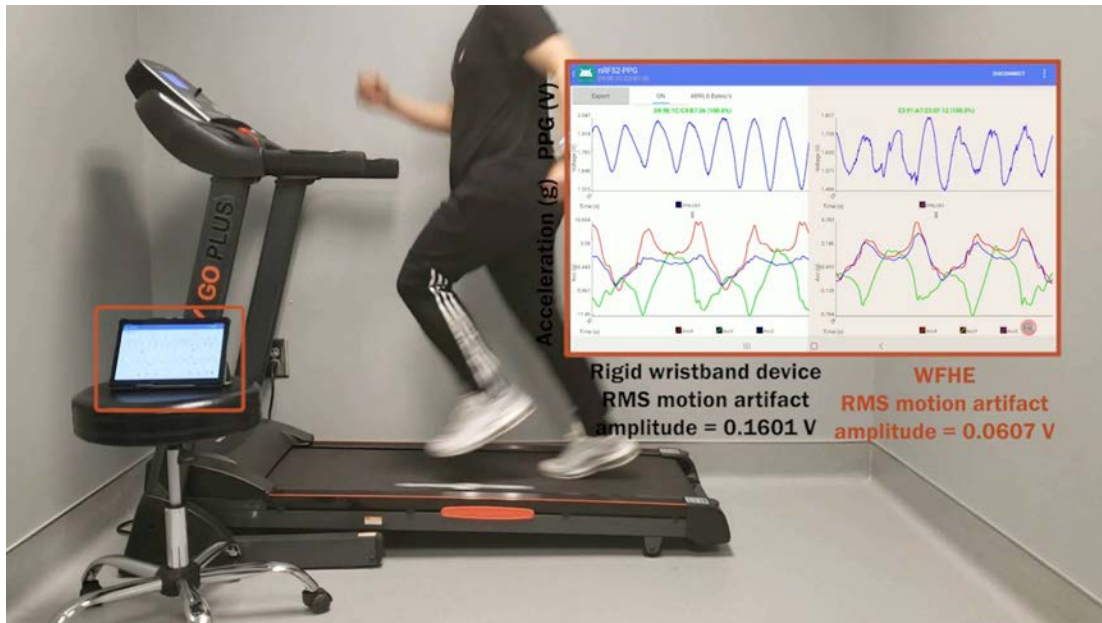
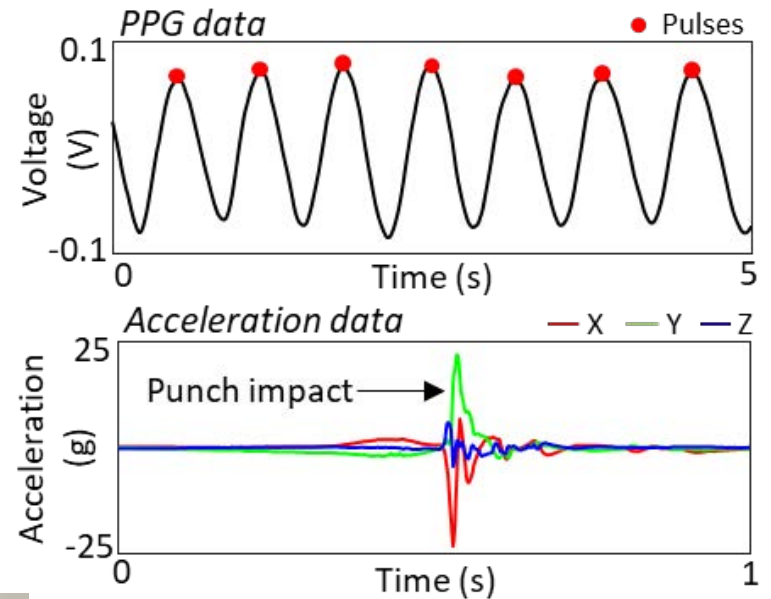




# Monitoring of Health and Performance



Heart Rate and Activity Intensity

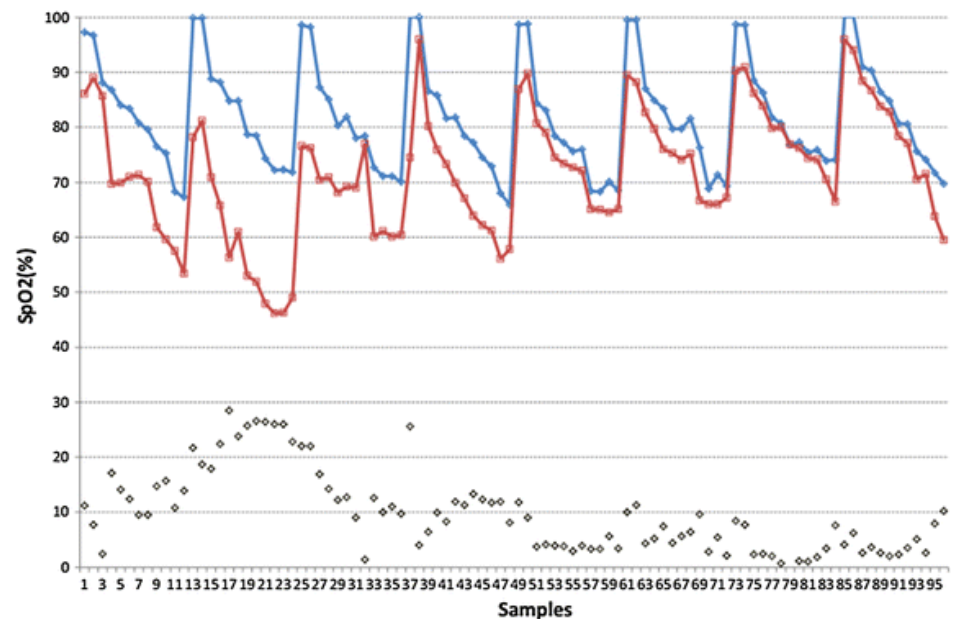
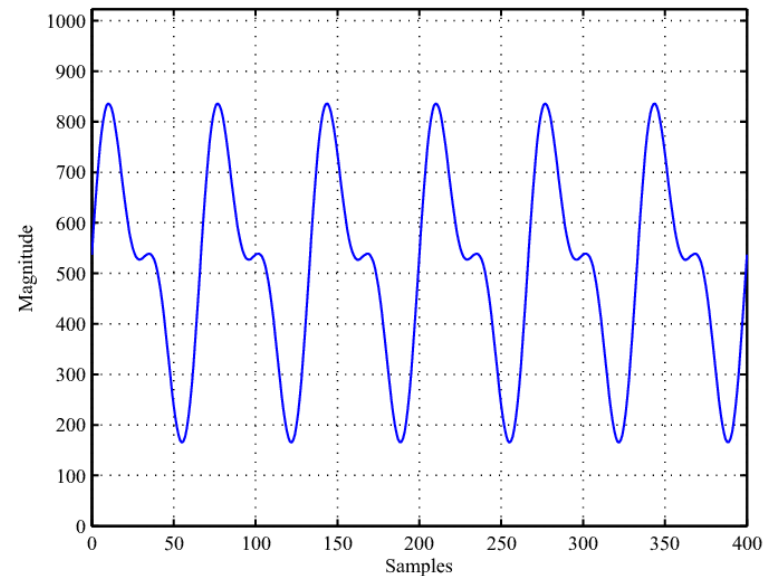
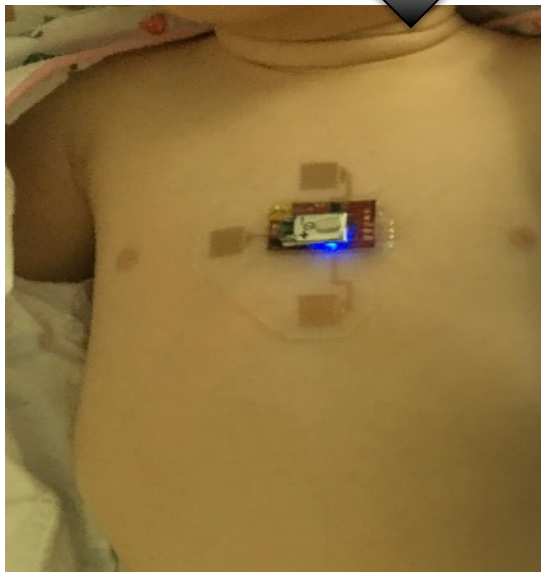


# Monitoring of Blood Oxygen Levels

Conventional rigid, finger-worn



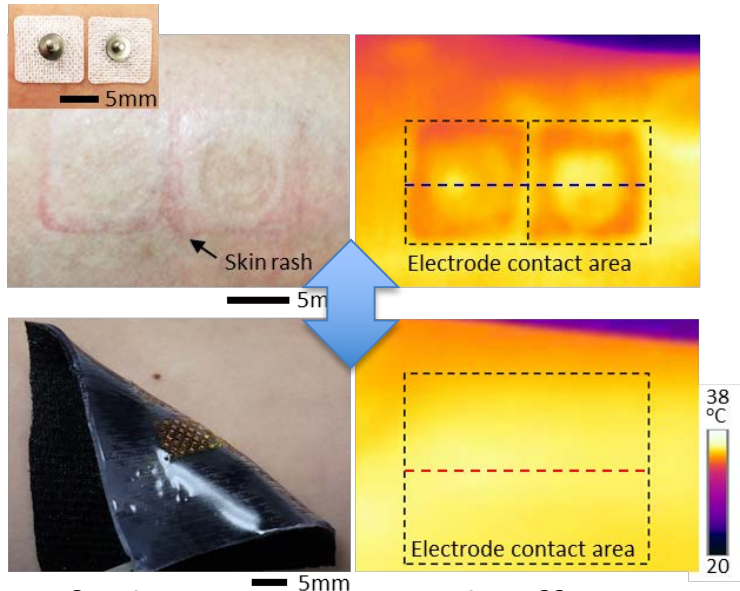
*Soft electronics*



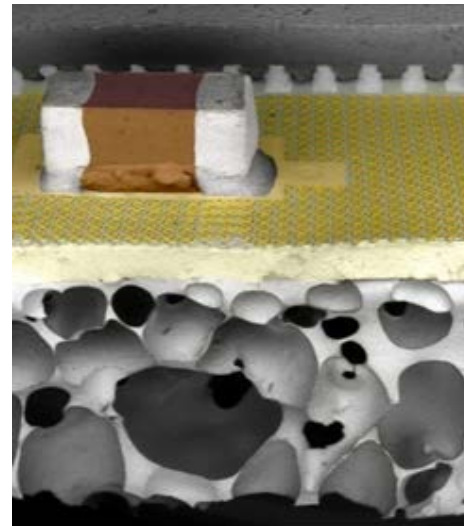


# Soft Material-Enabled Electronics

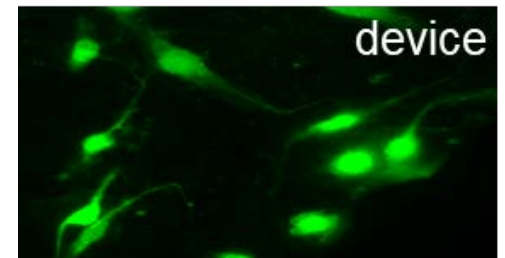
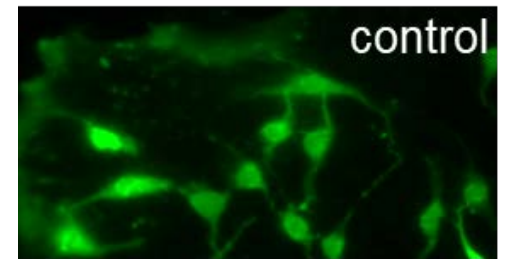
Skin-compatible, breathable, waterproof, and long-term wearable!



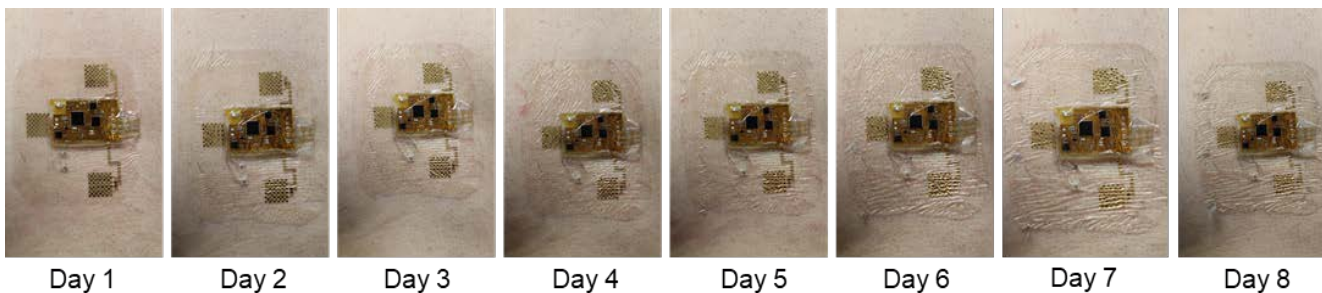
*Soft electronics – no side effect*



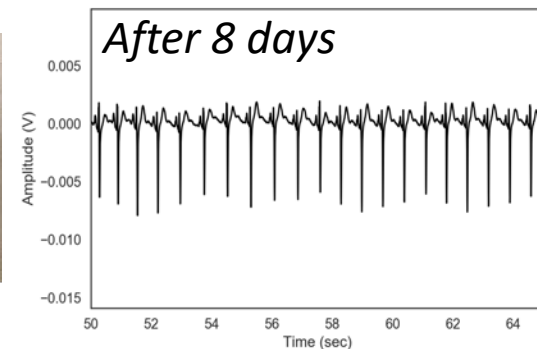
*Porous structure*



*Live cells on the device*



Day 1    Day 2    Day 3    Day 4    Day 5    Day 6    Day 7    Day 8



# Interested in Soft Electronics?

Looking for a partner for the Georgia Smart Grant (due: June 12<sup>th</sup>)



If interested in smart first responder project, please email me [whyeo@gatech.edu](mailto:whyeo@gatech.edu)







# #SMARTer Together

## Webinar Series

