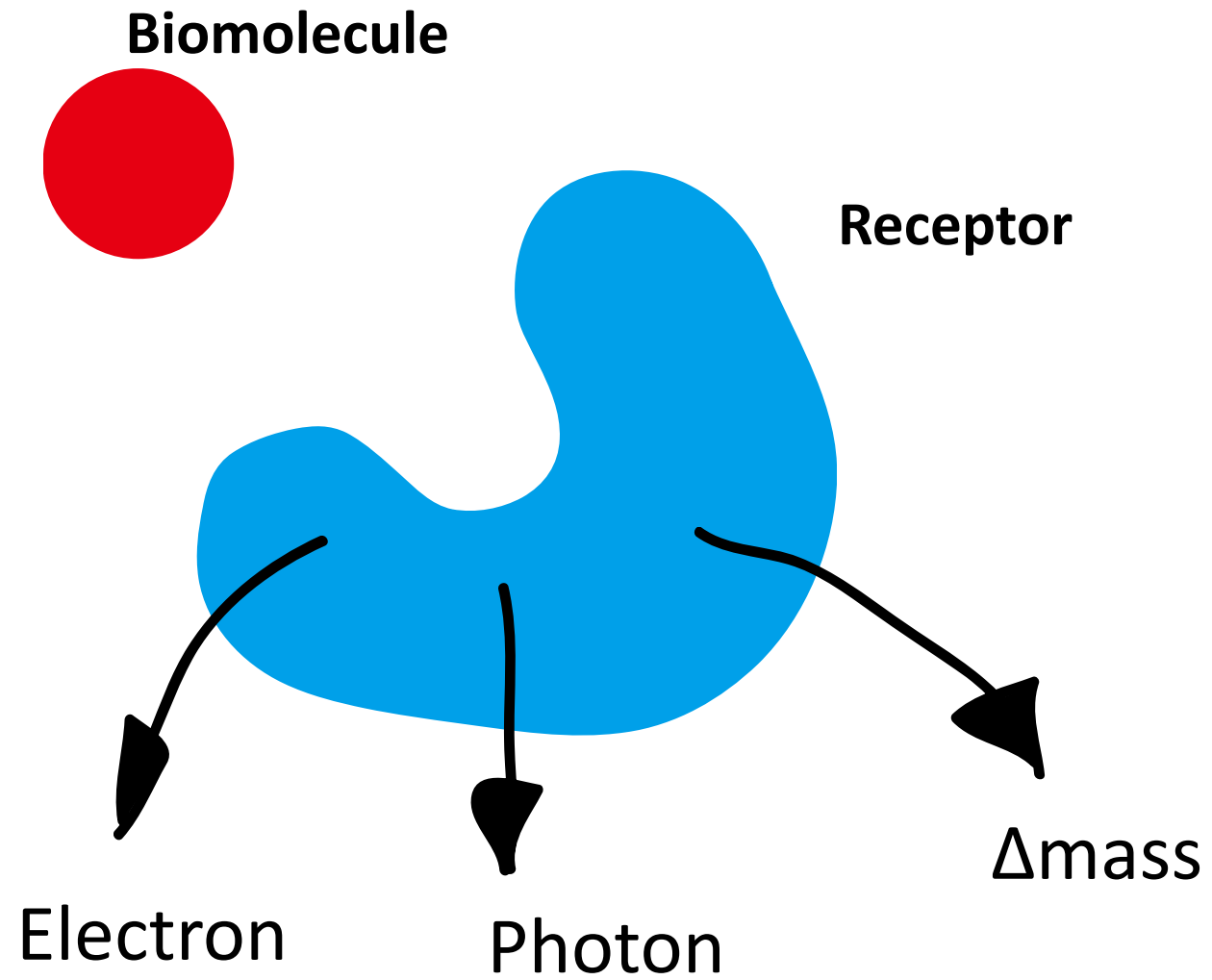


# 生体と機械の融合

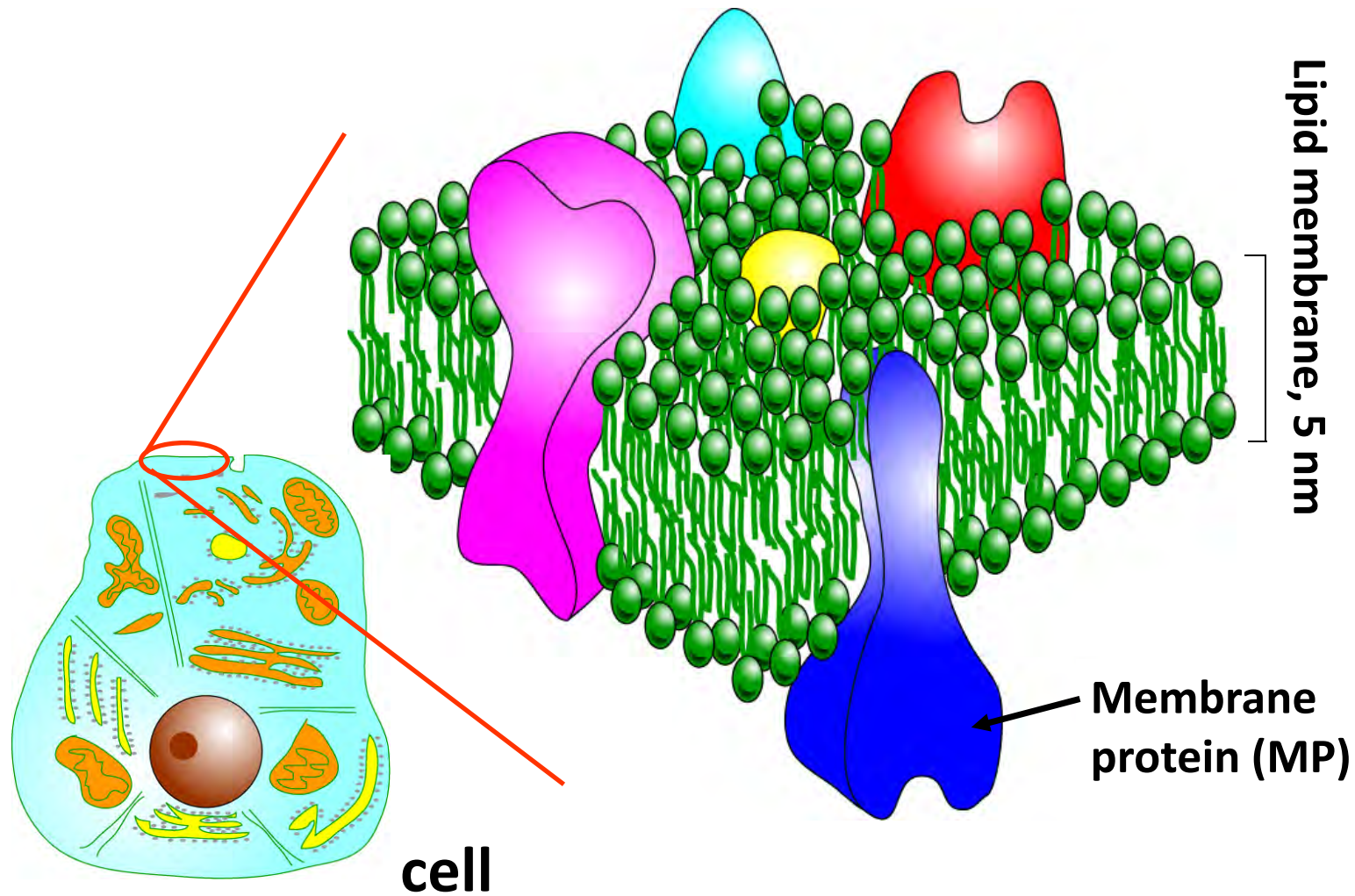


竹内昌治  
IIS, Univ. of TOKYO

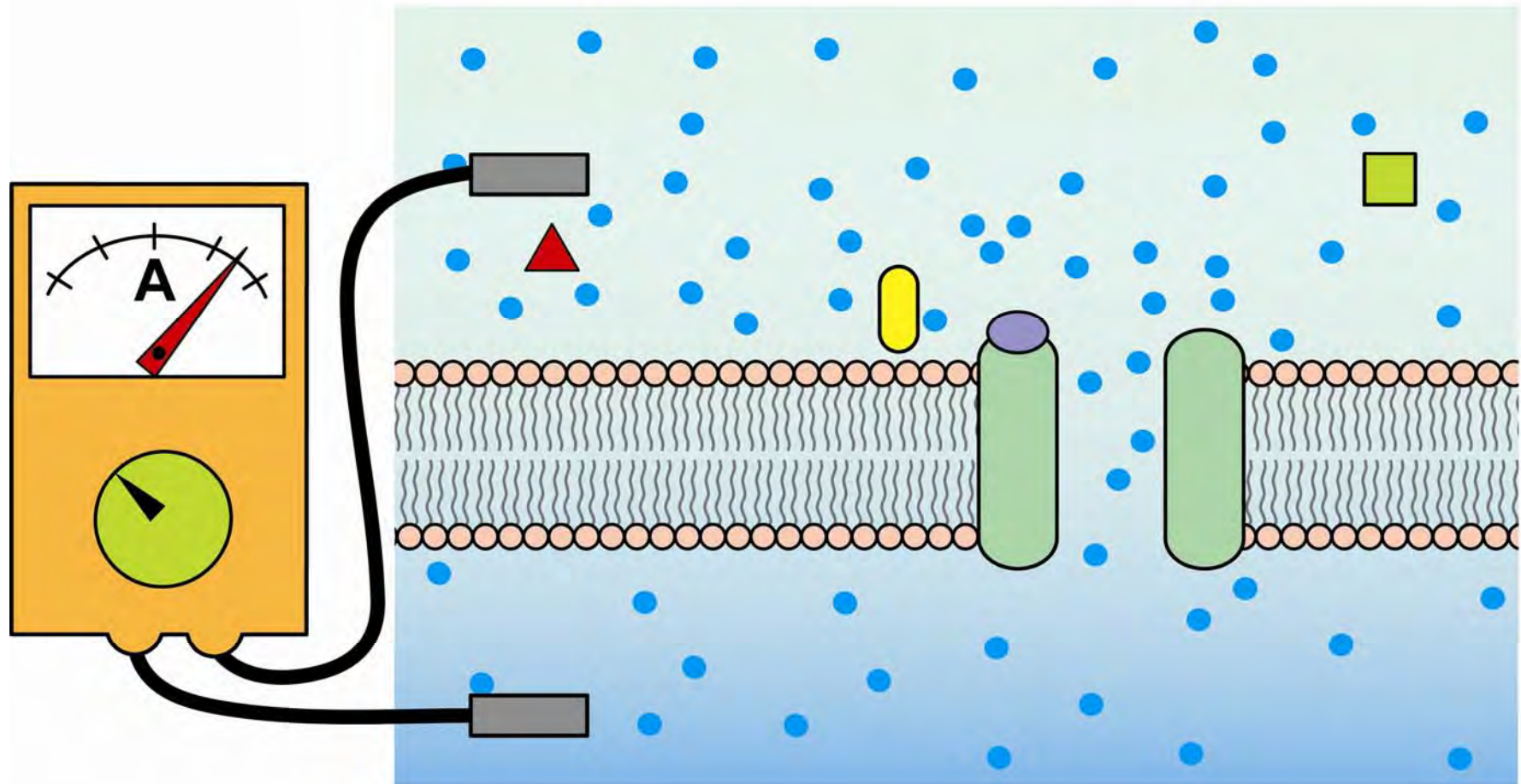
# Biosensors



# Ion channels are ultimate biosensors

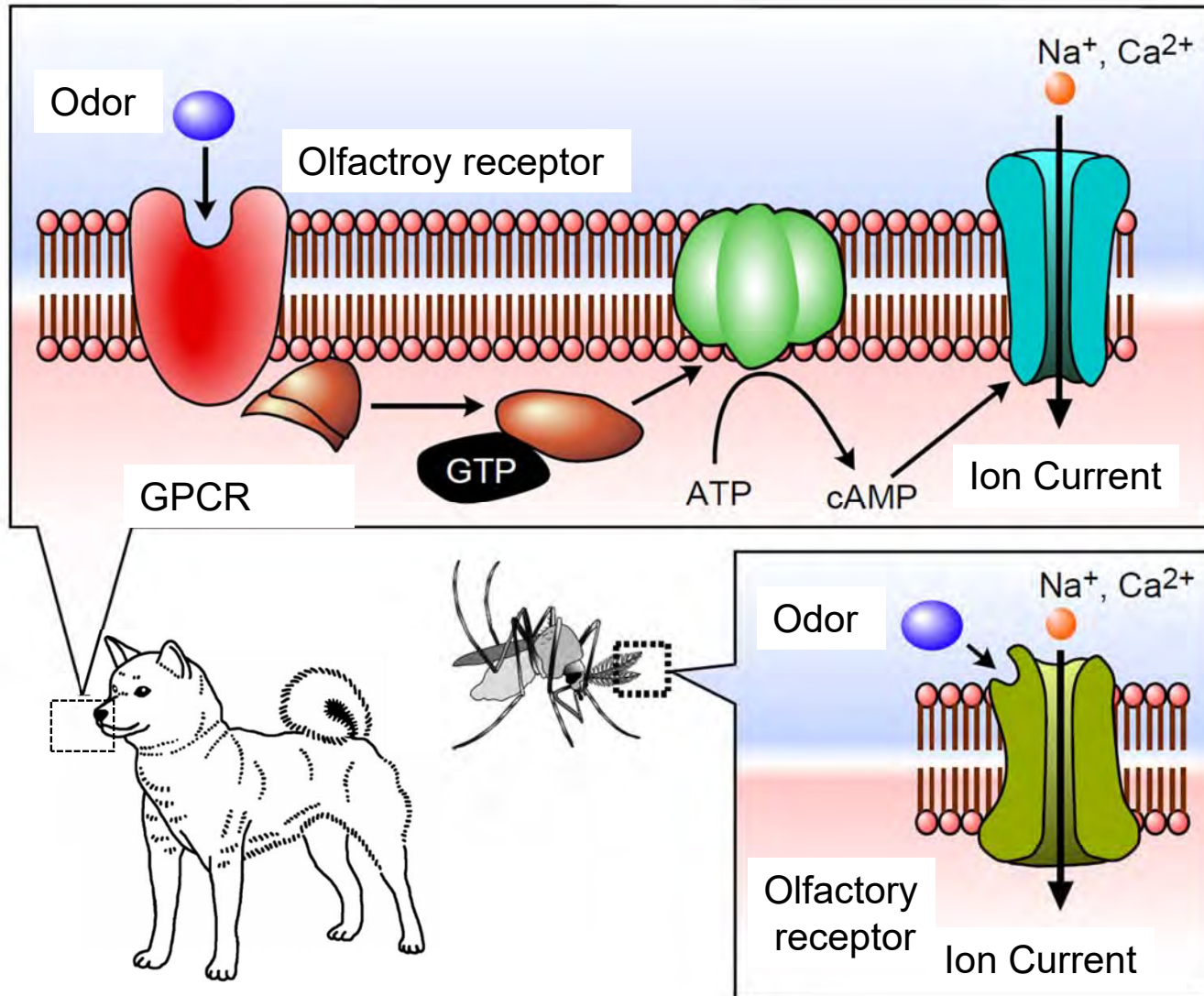


# Ion channels are ultimate biosensors



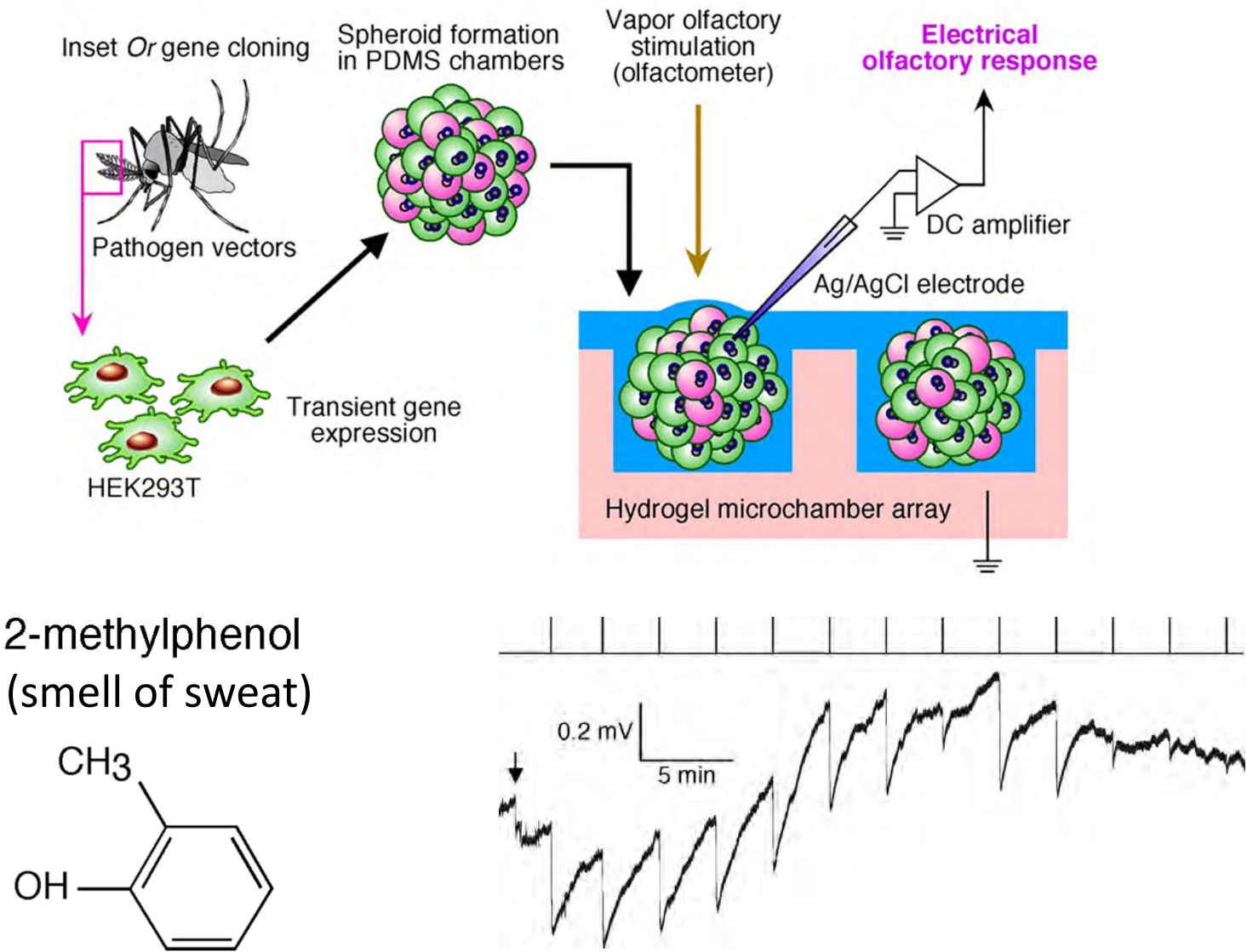
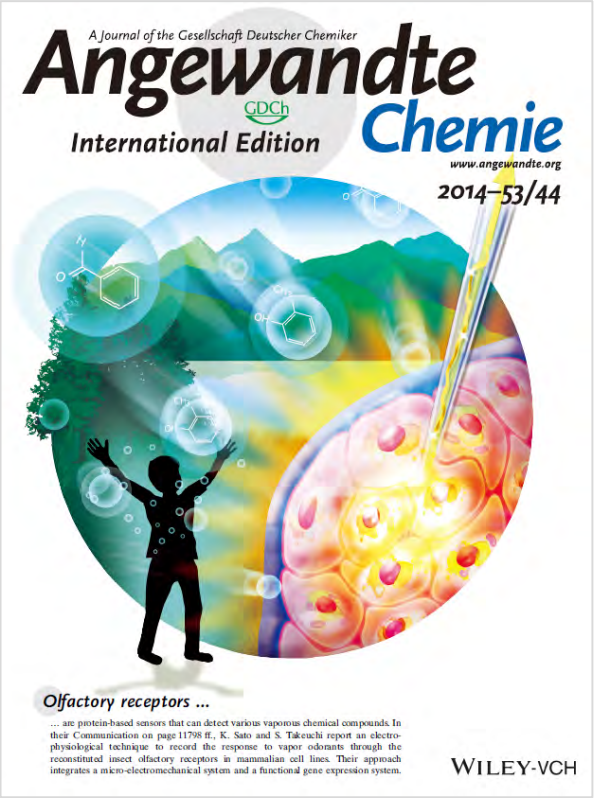
**Single molecule  $\rightarrow 10^7$  molecules !**

# mammalian vs insect

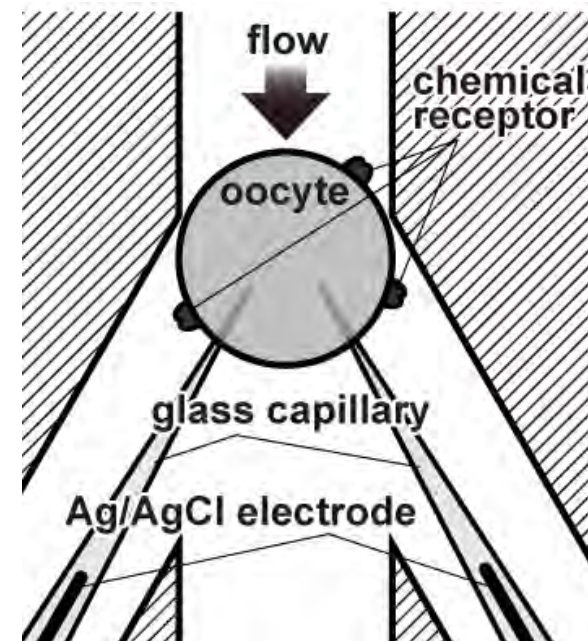
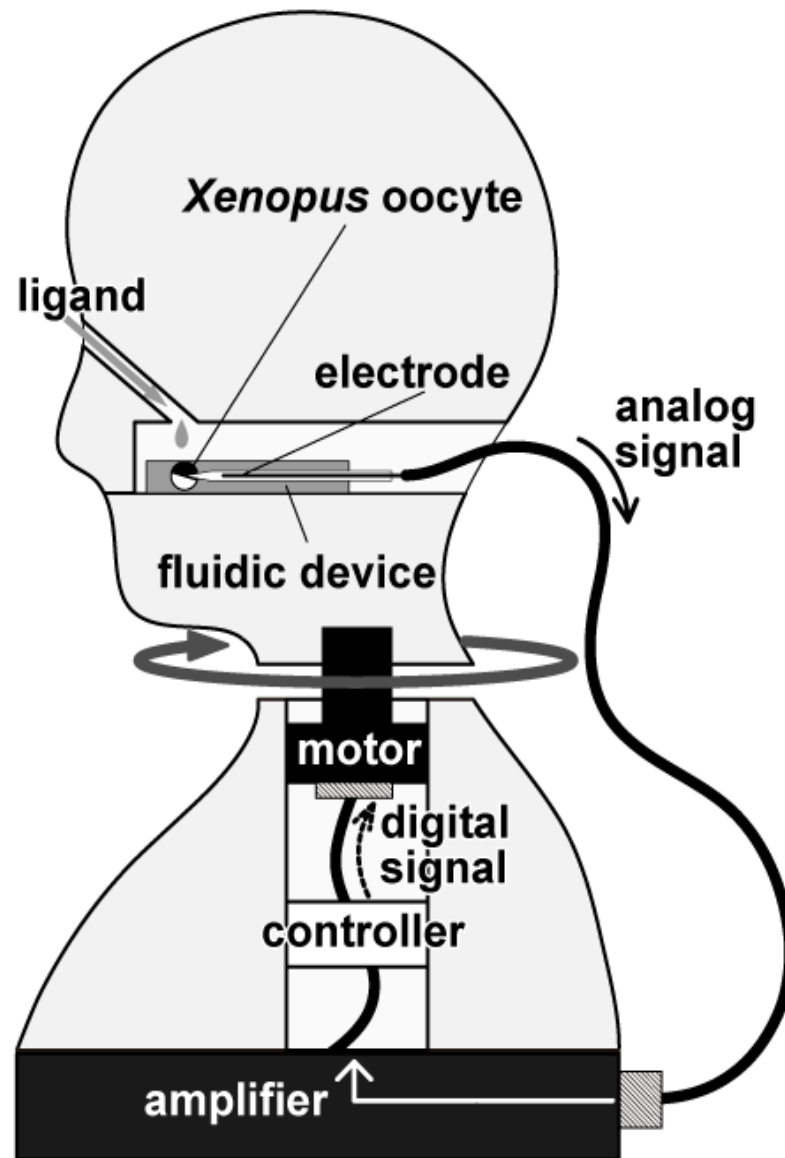




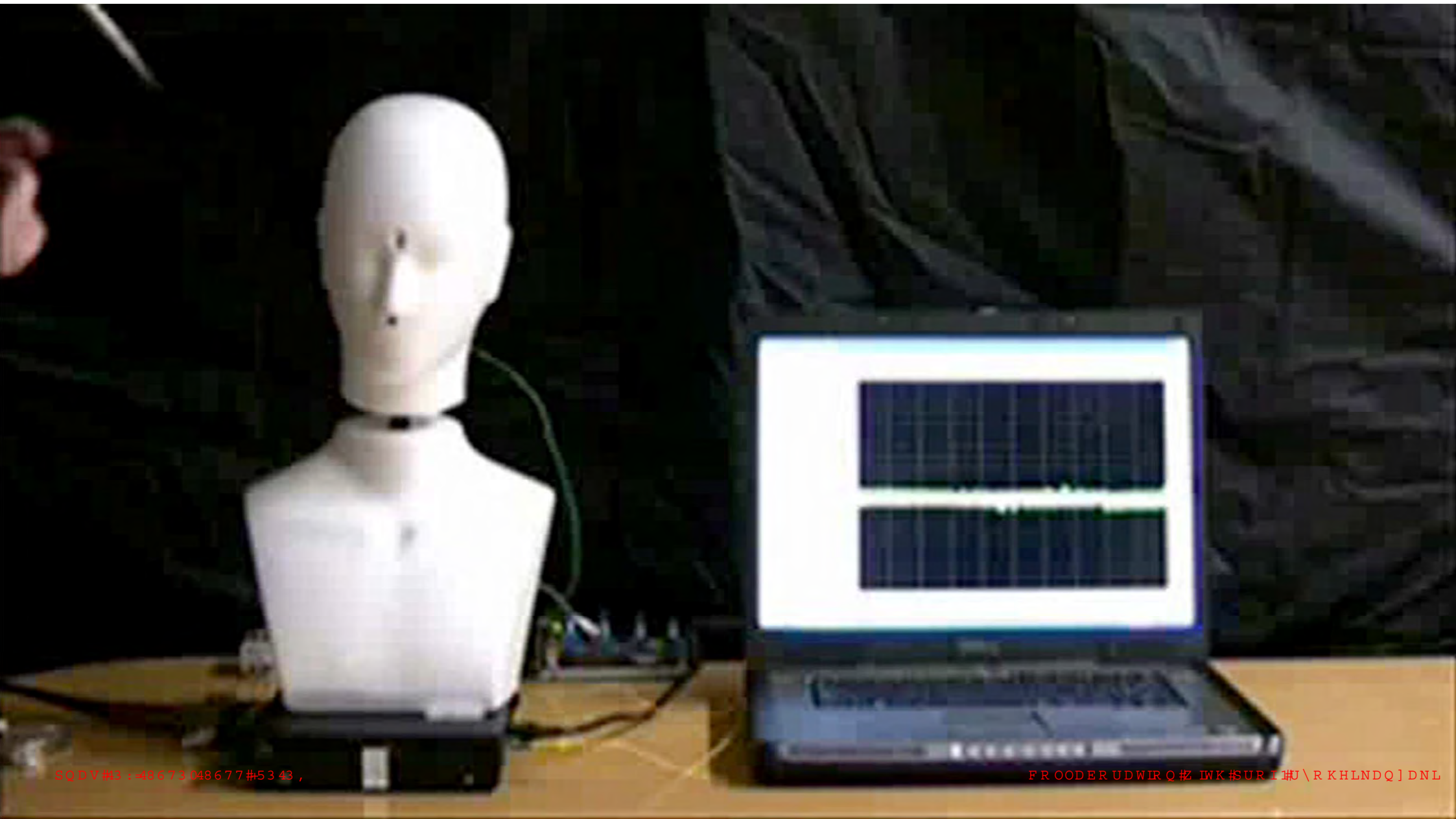
# Cell-hybrid biosensors



## Robot nose



PNAS 107:15340-15344 (2010)



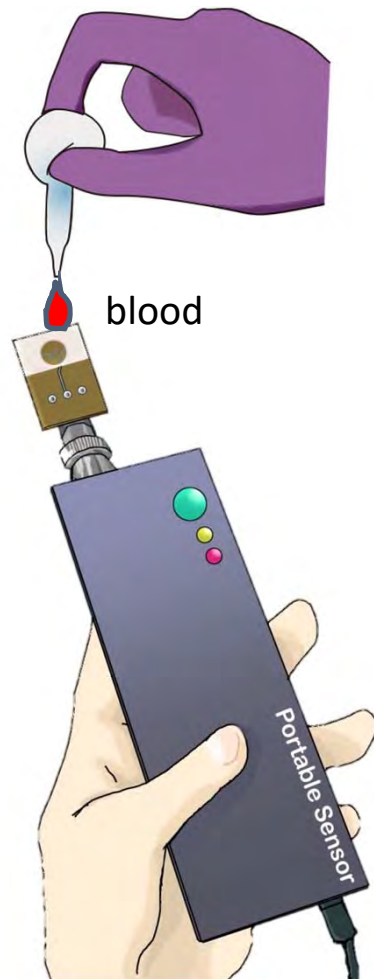
5QDVW3 : 48673 048677 #53 43 ,

FRODERUDWIRQ #Z IWK #SUR I #J \ R KHLNDQ ] DNL



# Applications?

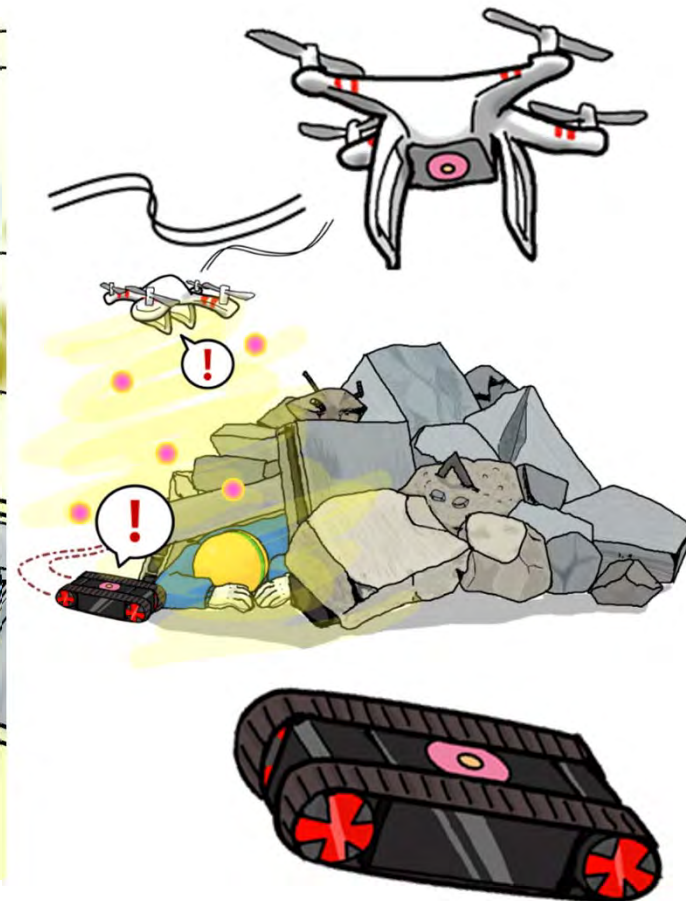
Blood testing



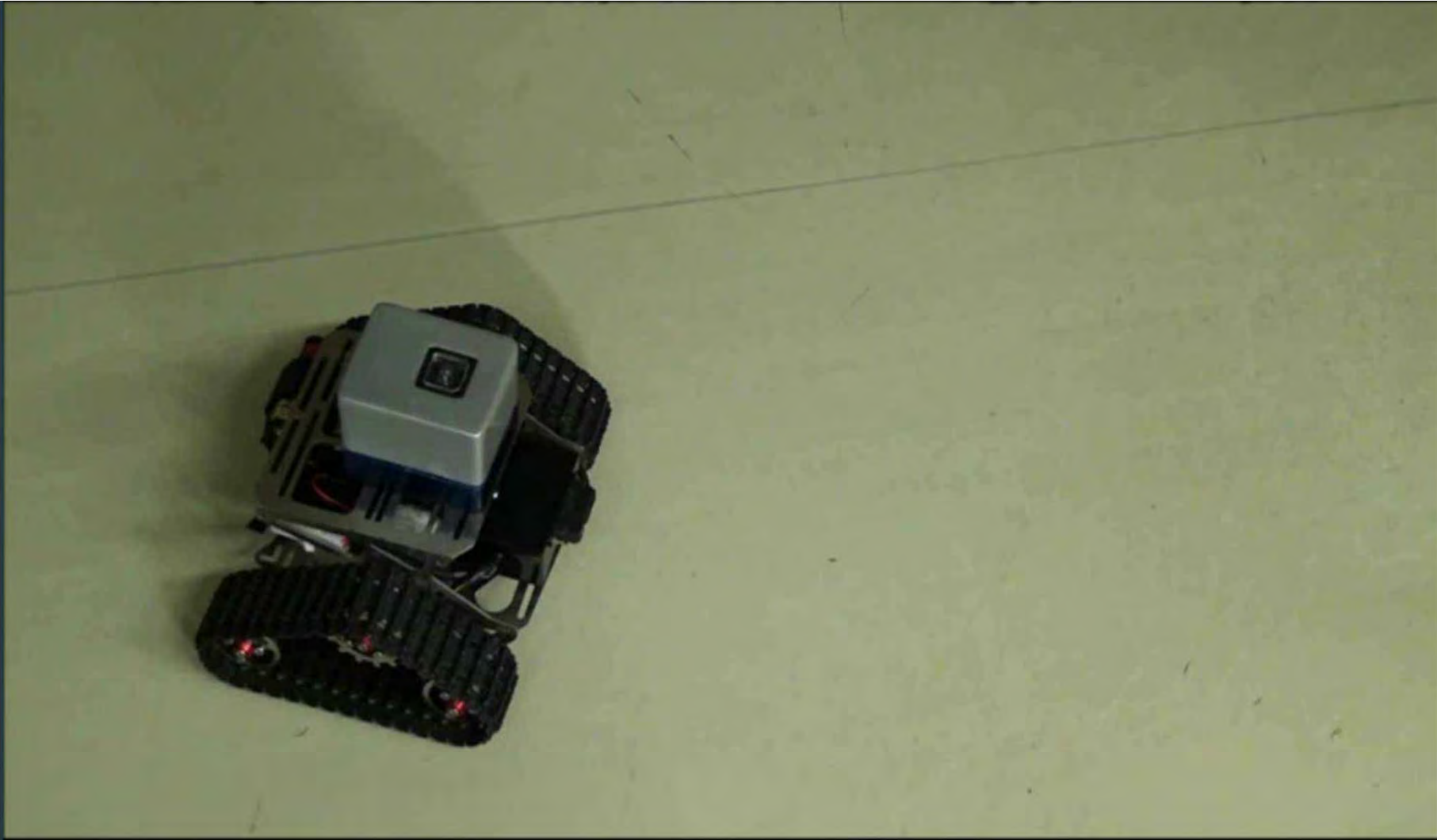
Food check



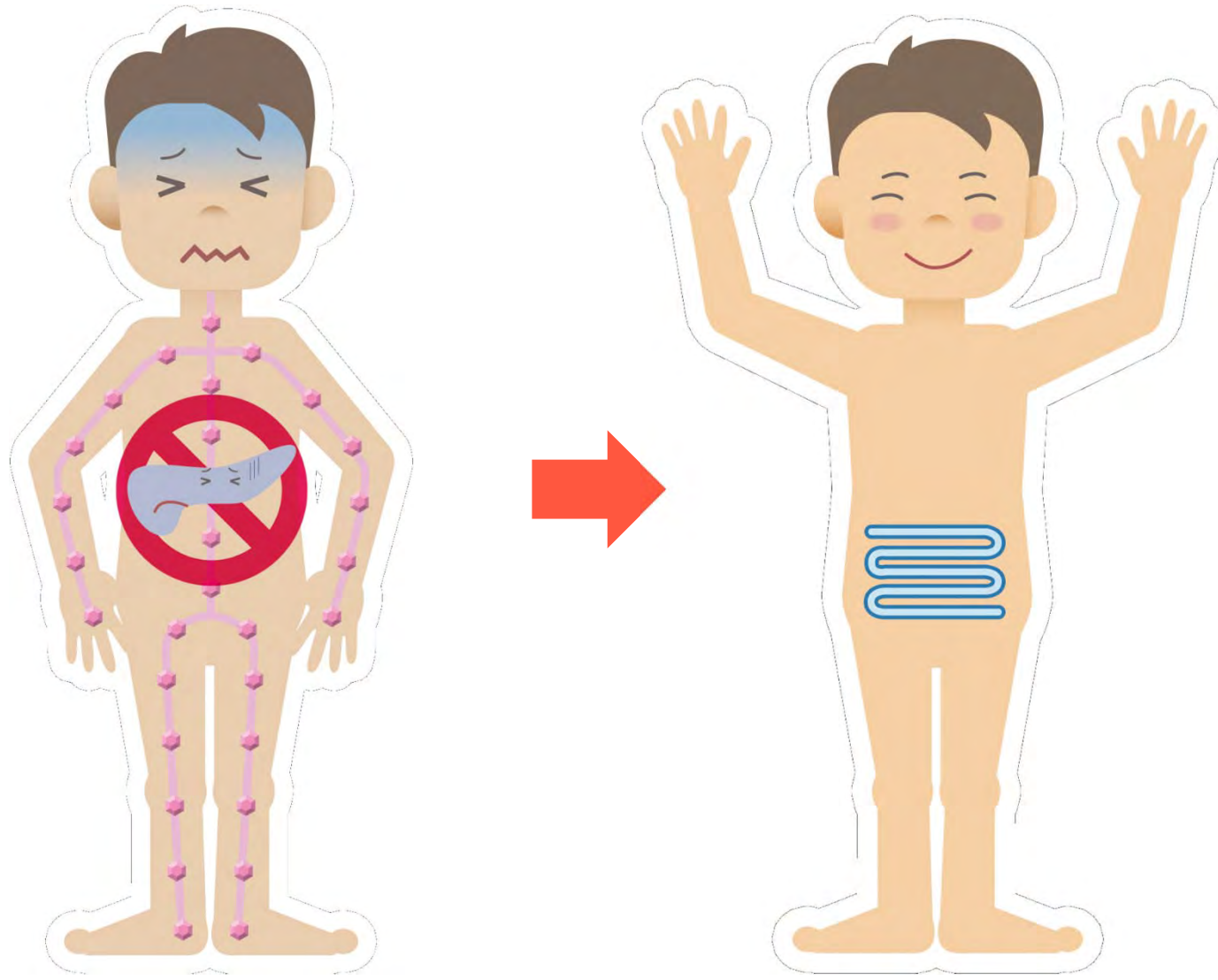
human detection in disaster



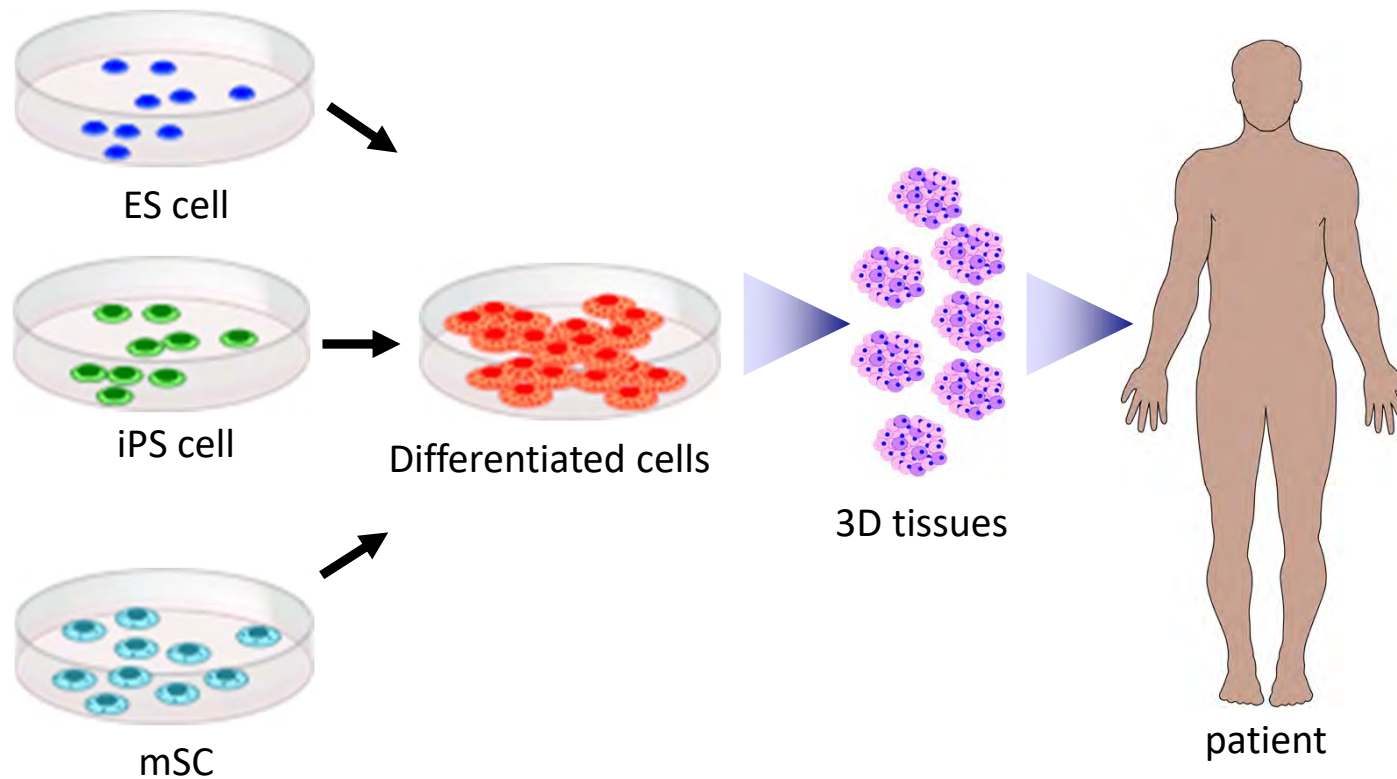
# A robot react to human sweat



# $\beta$ -Cell therapy



# Cell therapy using stem cells

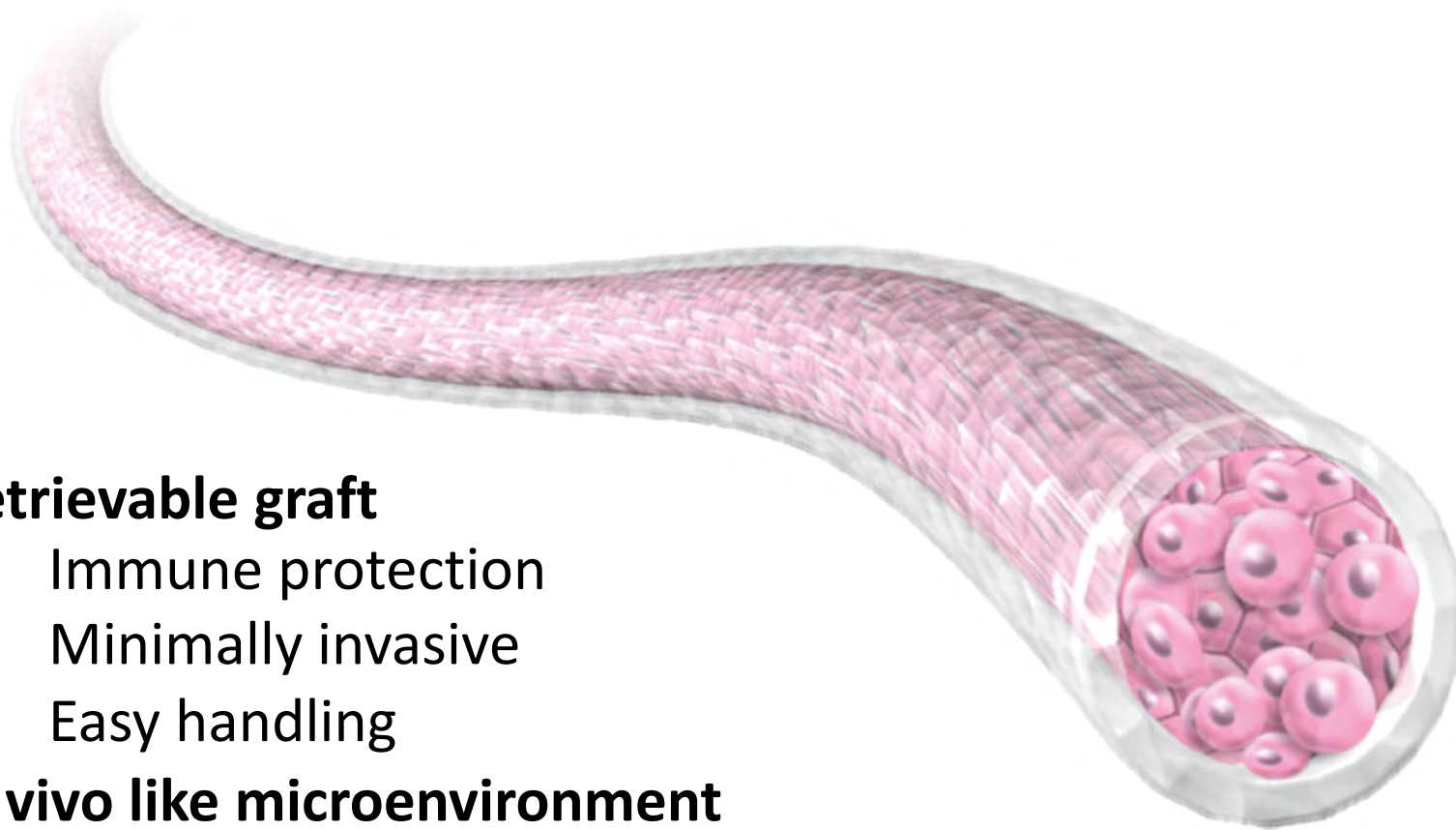


**graft**

Immuno-protectability  
Retrievability for safety



# Biohybrid transplants (Islets x hydrogel)



## **Retrievable graft**

Immune protection

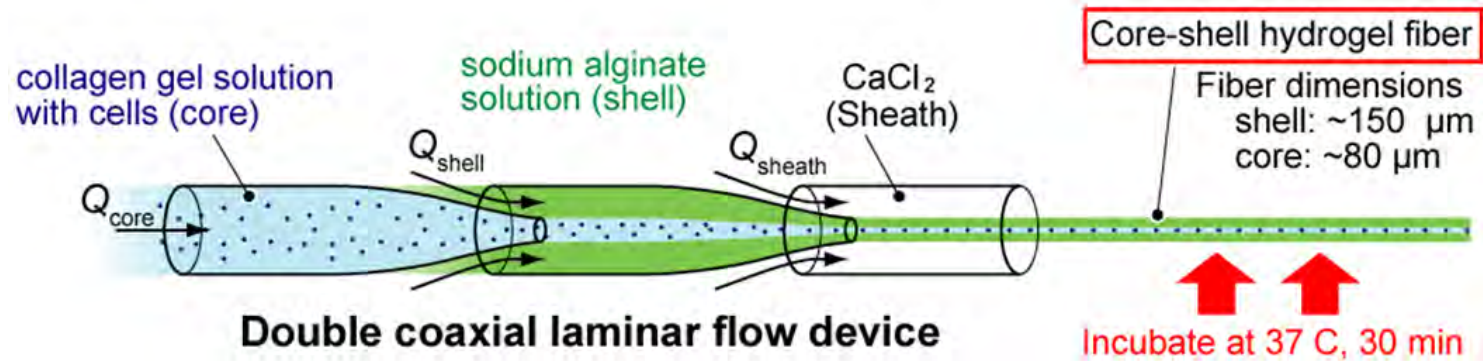
Minimally invasive

Easy handling

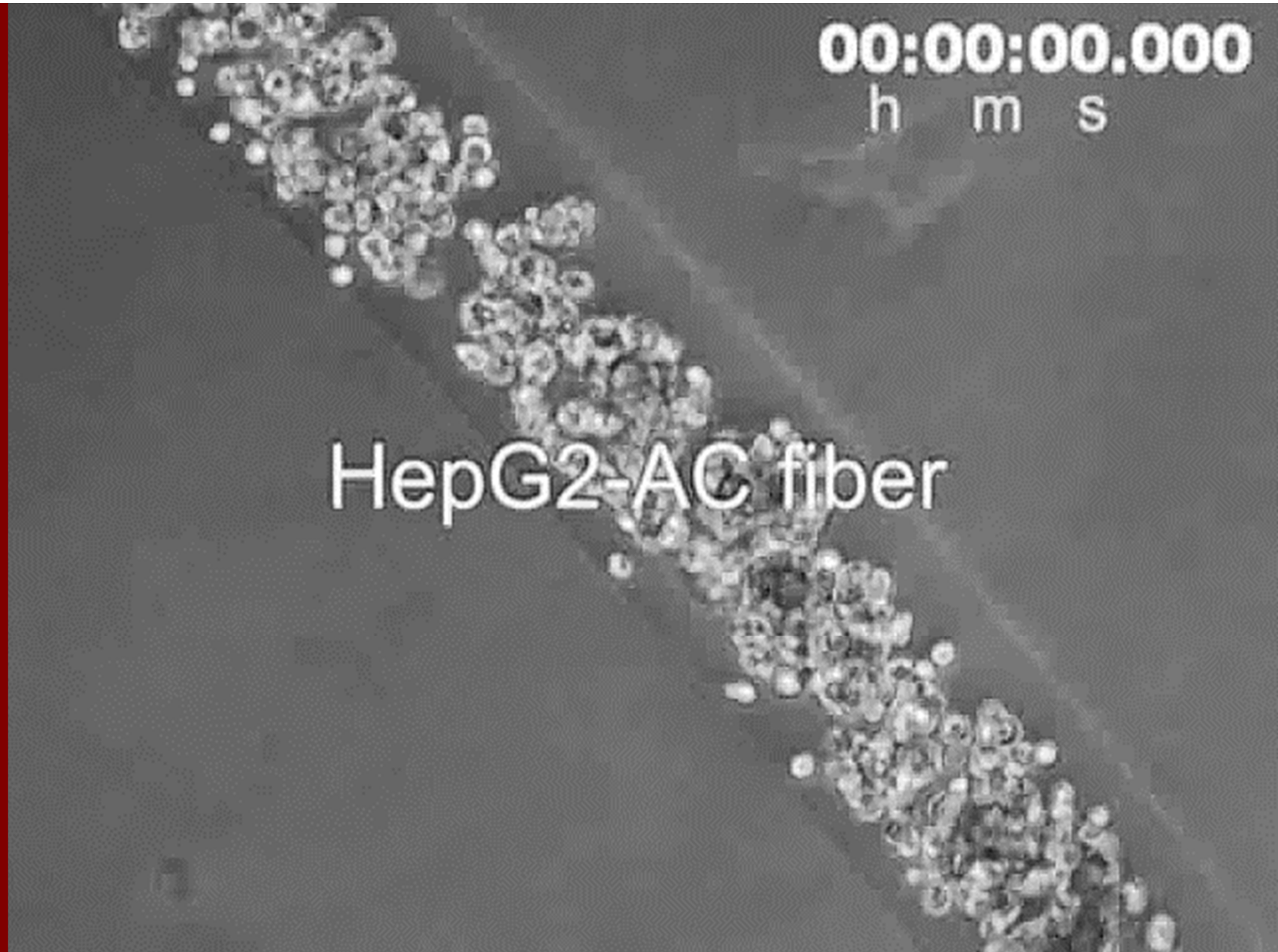
## **In vivo like microenvironment**

ECM-rich and 3D microenvironment

# Fiber formation

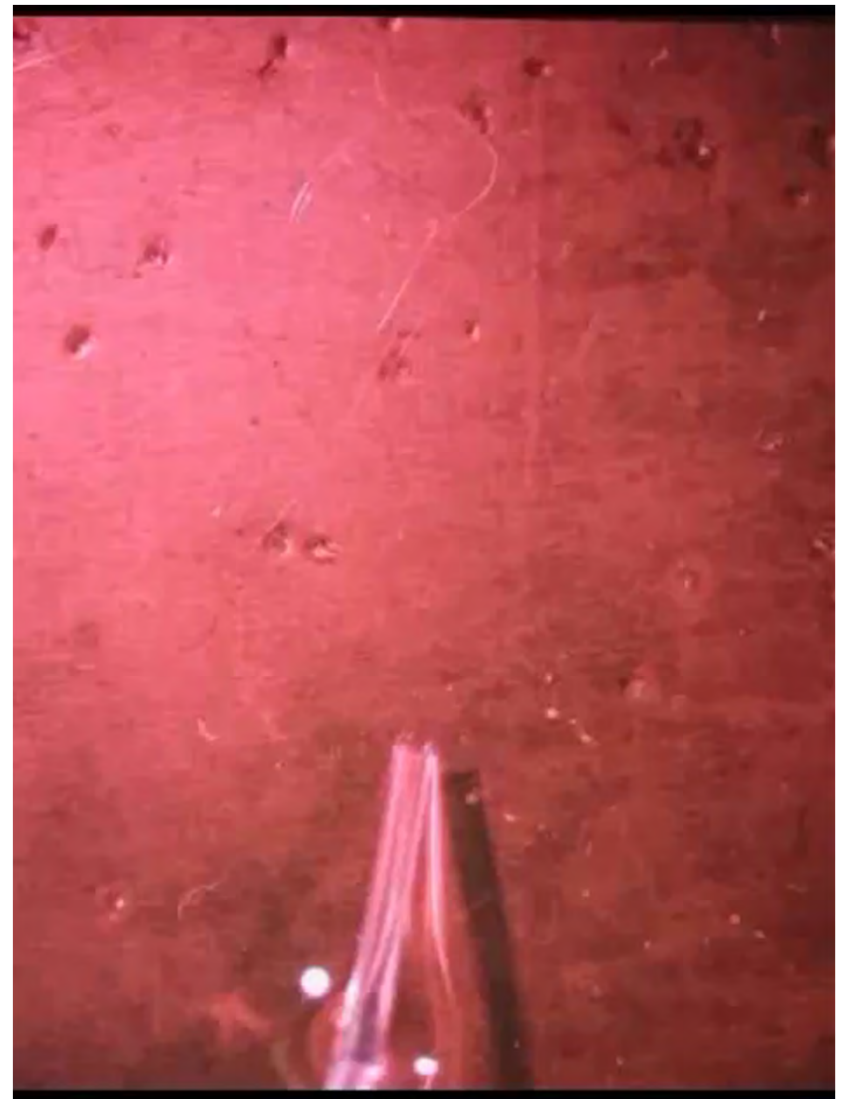


**Growth of  
Cells in 3D  
micro-  
environment**



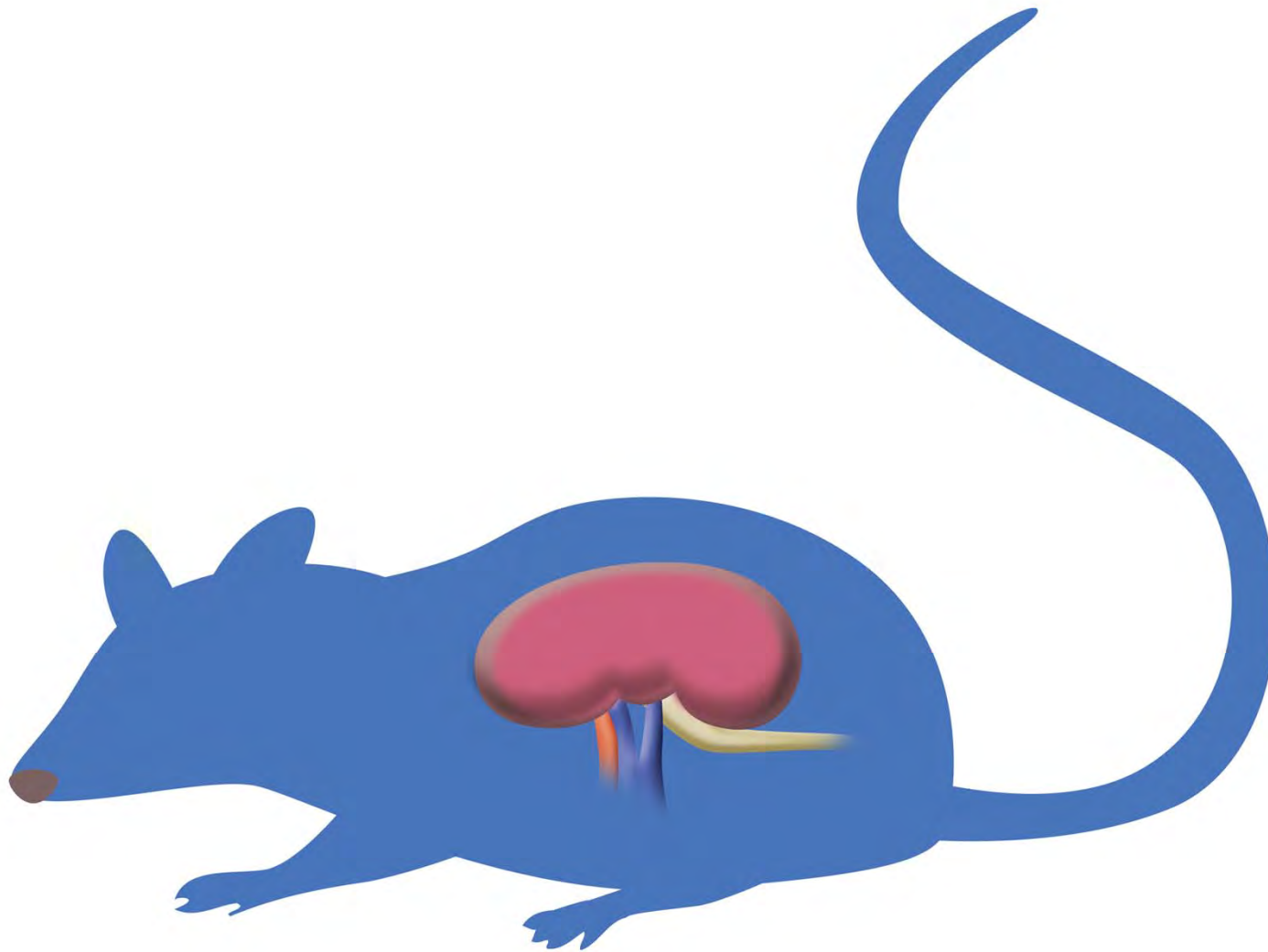


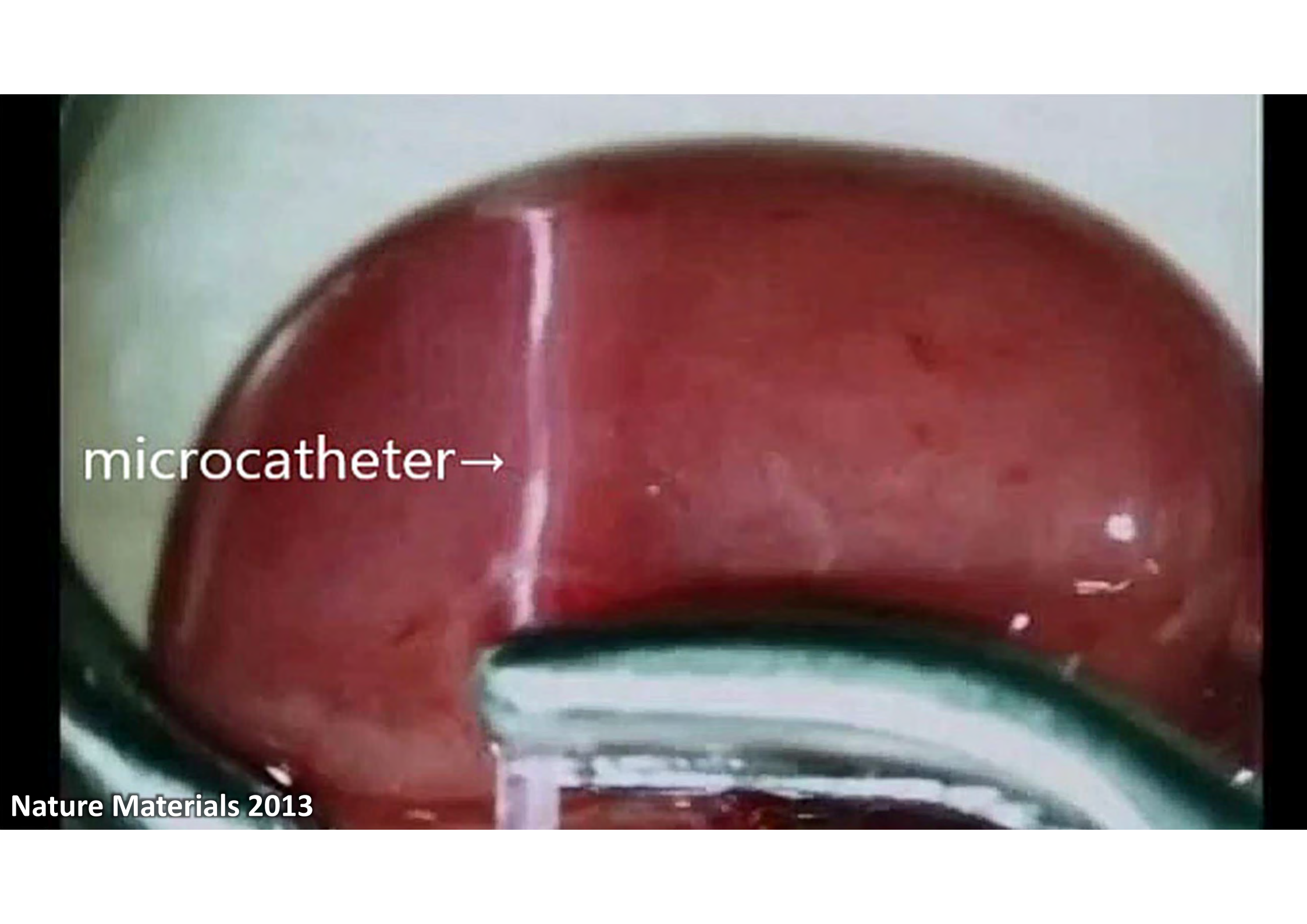
# Fiber handling





## Implantation into the kidney of a diabetic mouse





microcatheter→