



# ME 20N: Haptics: Engineering Touch

## Autumn 2017

### Week I:

# Introduction to haptics and human touch

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# hap·tic ('hap-tik)

adj. Of or relating to the sense of touch.

[Greek *haptikos*, from *haptesthai*, to grasp, touch. (1890)]

## Cutaneous

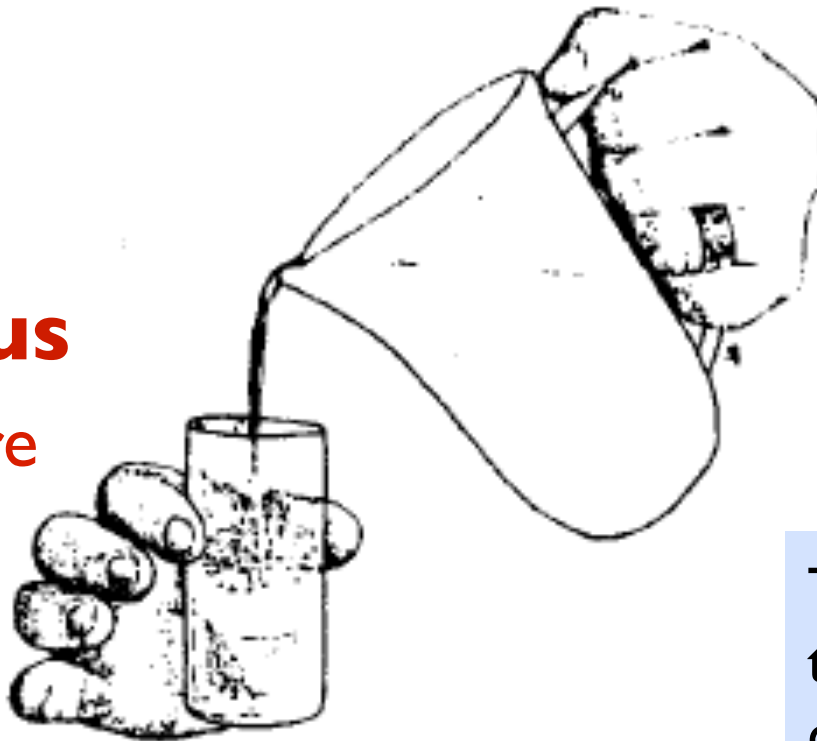
Temperature

Texture

Slip

Vibration

Force



Johansson and Westling

## Kinesthesia

Location/configuration

Motion

Force

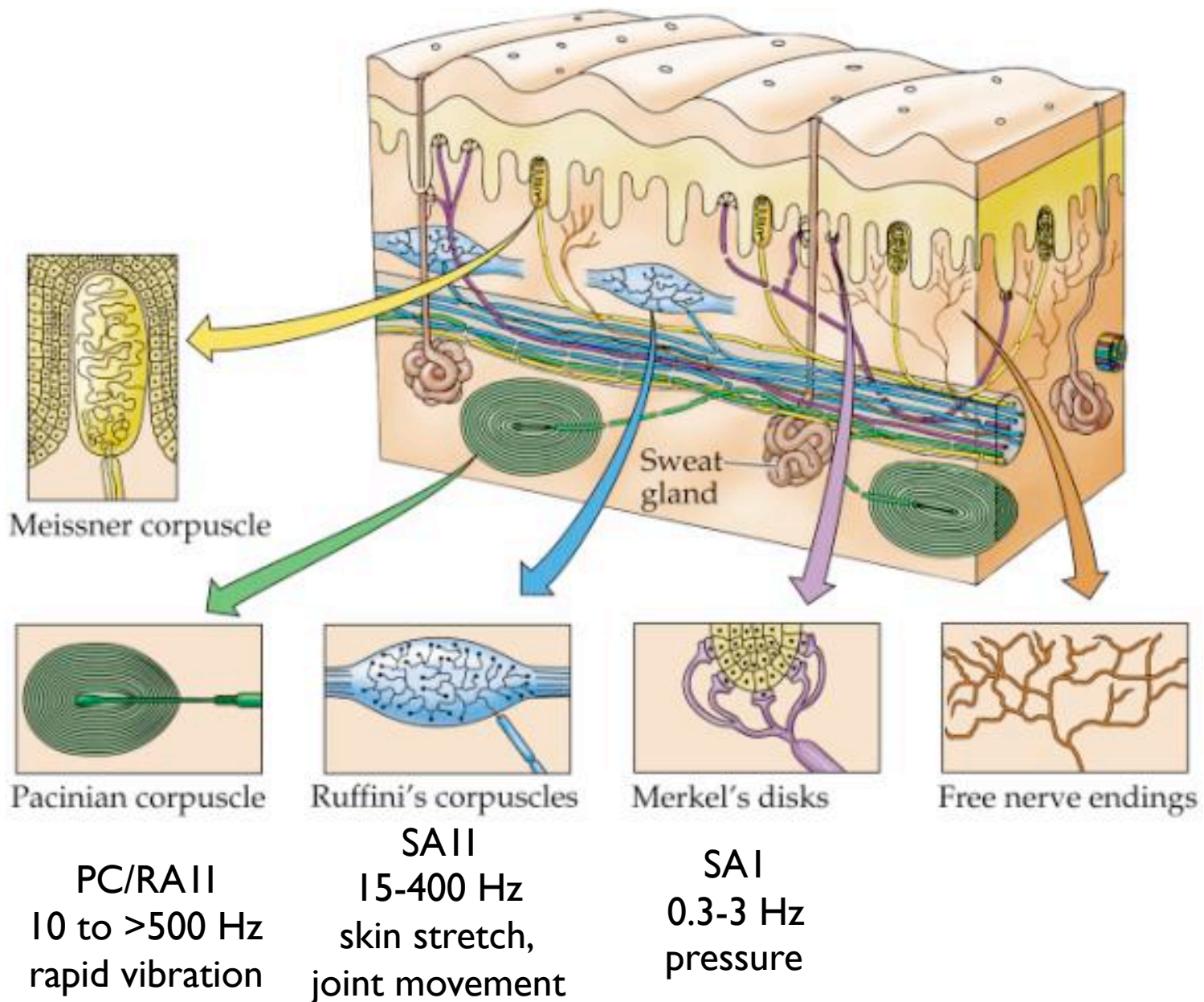
Compliance

The haptic senses work together with the motor control system to:

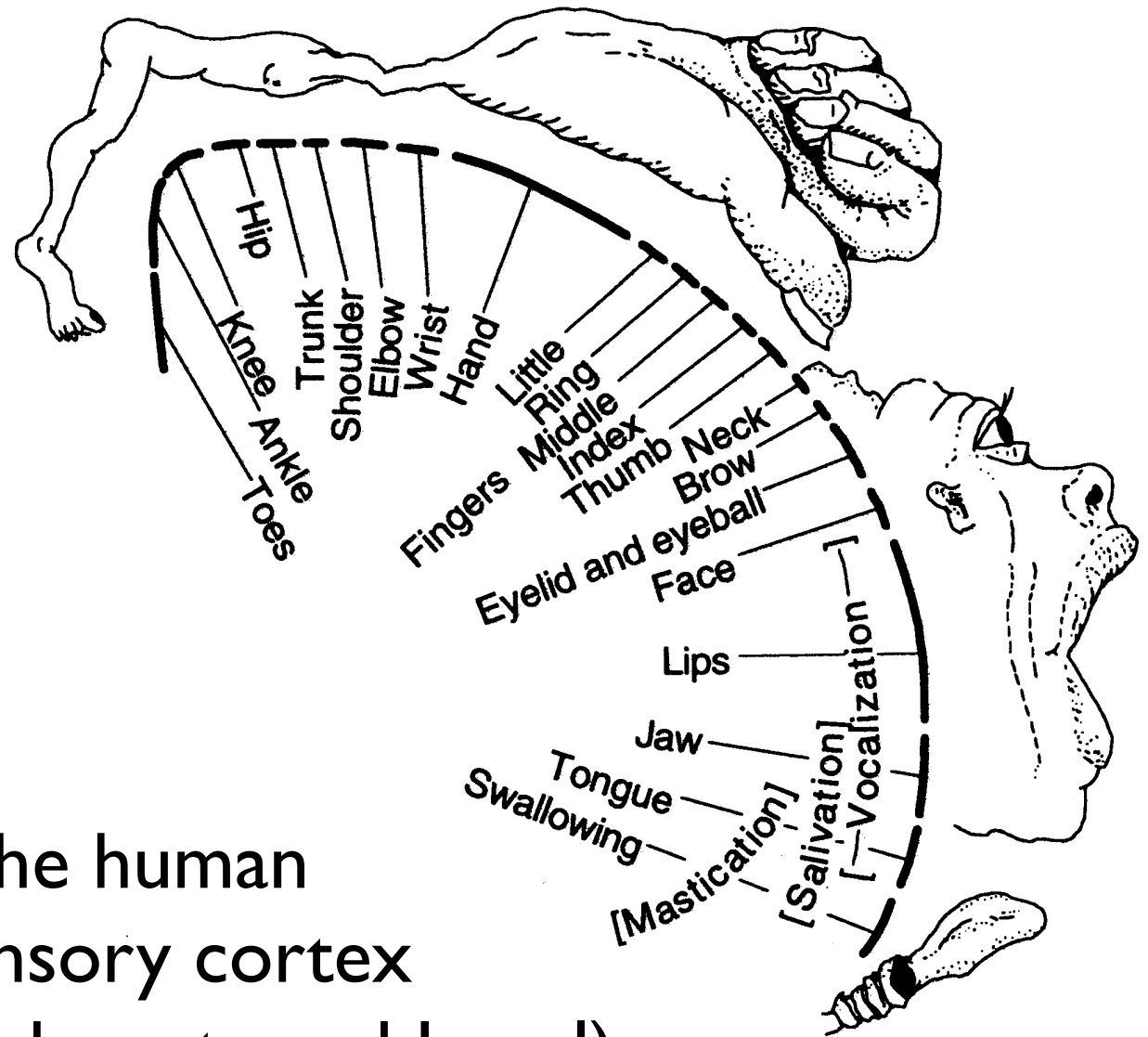
- Coordinate movement
- Enable perception

# cross section of glabrous skin

RAII  
3-40 Hz  
taps on skin



# sensory homunculus

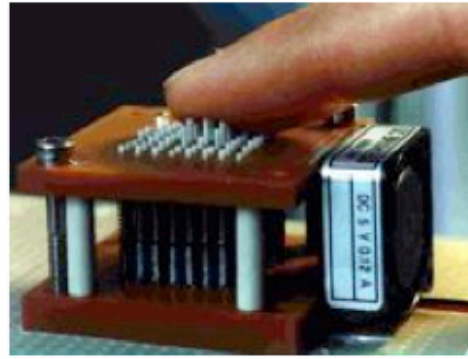


mapping the human  
somatosensory cortex  
(Kandel, Schwartz and Jessel)

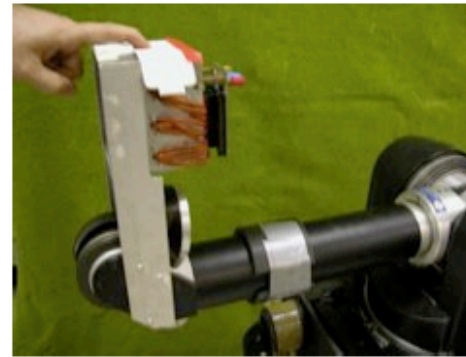
# 2-point discrimination test

- Goal: Choose three locations on the body and determine the distance at which each subject can no longer discriminate between the two point contacts. (In other words, when do your subjects think there is a single point contact, rather than two?)
- Work in groups of 2-3 people. For each body part, test all four “subjects”.
- Construct your own experimental apparatus. For your point contacts, use a small blunt tip. Attempt to push with a constant, light force for every subject.
- Analyze your experimental data. Which body part is the most sensitive? What are sources of experimental error and variance?

## Tactile Devices



Stimulate skin to create contact sensations



## Hybrid Devices

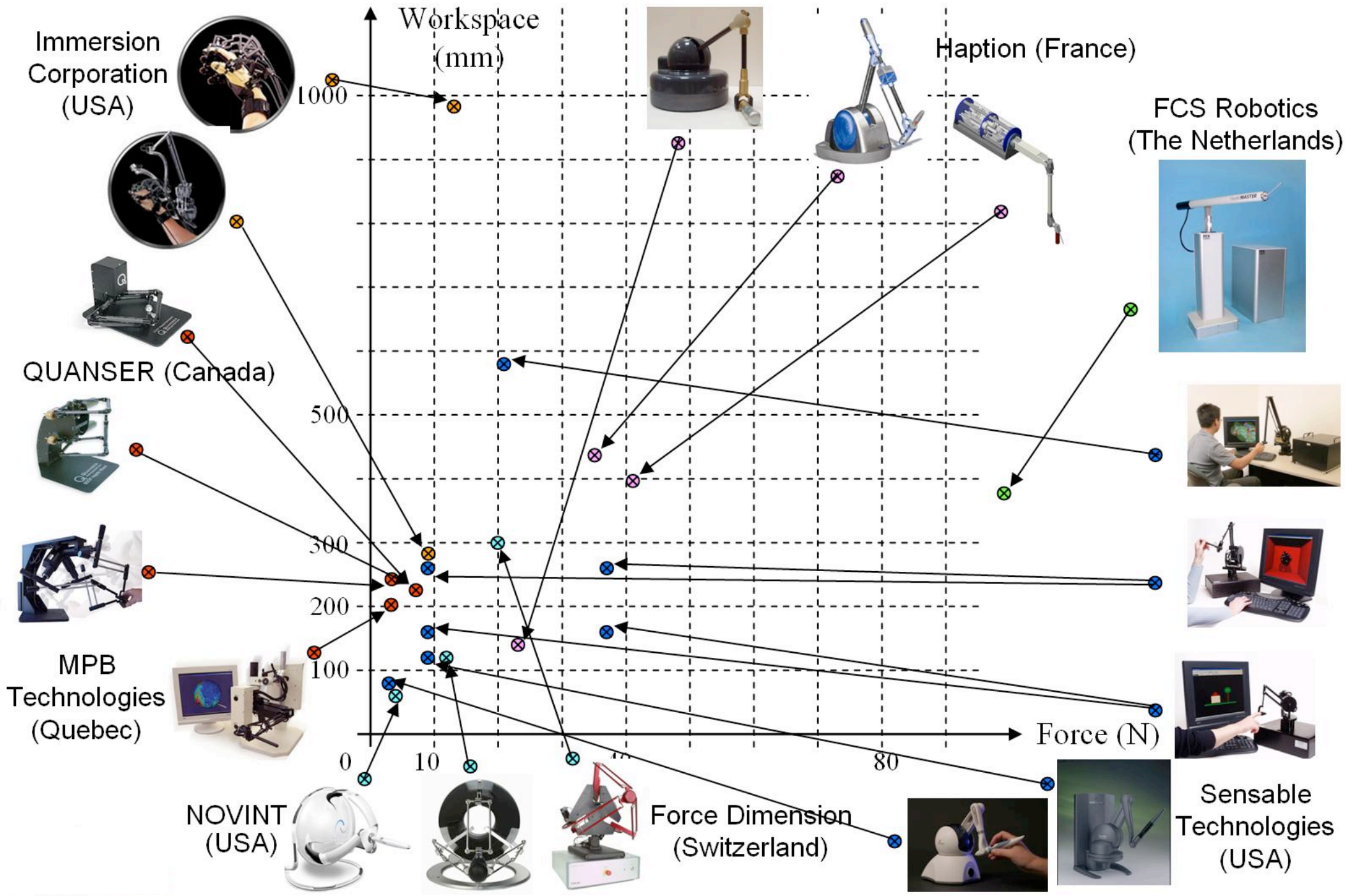
Attempt to combine tactile and kinesthetic feedback



## Kinesthetic Devices

Apply forces to guide or inhibit body movement





# Your TO DO list

- Sign up for Product Realization Lab safety training at <http://webshop.stanford.edu>. No spots are open today, but the website says that more will open tomorrow. (For more information about the PRL, see <http://productrealization.stanford.edu>)
- Starting in Week 3, bring your laptop and power cord