

# Slim textiel – Smart textiles

Prof. Lieva Van Langenhove

Department of Textiles

# Smart textiles?

Monitoring and reacting

The environment, man and his/her  
environment, itself

Passive or active intelligence

## Why textiles?

- All around
- Versatile
- Light weight
- Large contact area with body
- Comfortable
- Easy to use

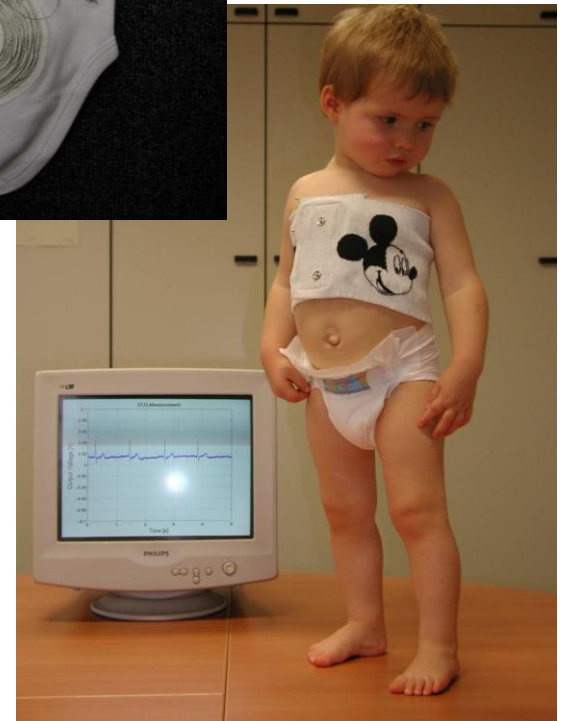
# Functions of smart textiles

- Sensor
- Actuator
- Data processing
- Communication
- Energy supply
- Comfortable
- Resistant

# Objective



UGent  
UPisa  
Georgia Tech



The textile can absorb, reflect, shield,  
measure or generate ...

Temperature

Heat flux

Electromagnetic  
fields/radiation

Humidity

Chemicals

Gases

Radiation

Electric properties

Movement

Forces

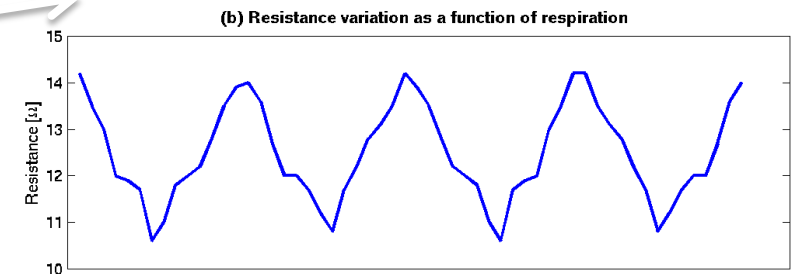
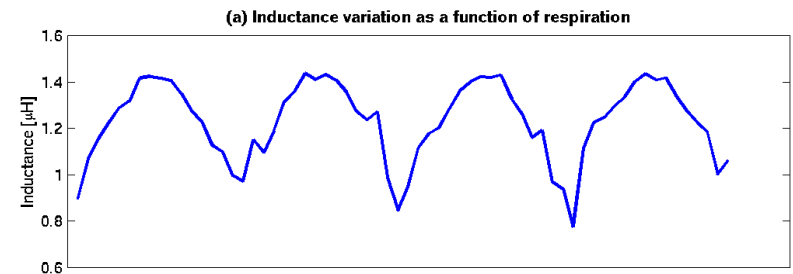
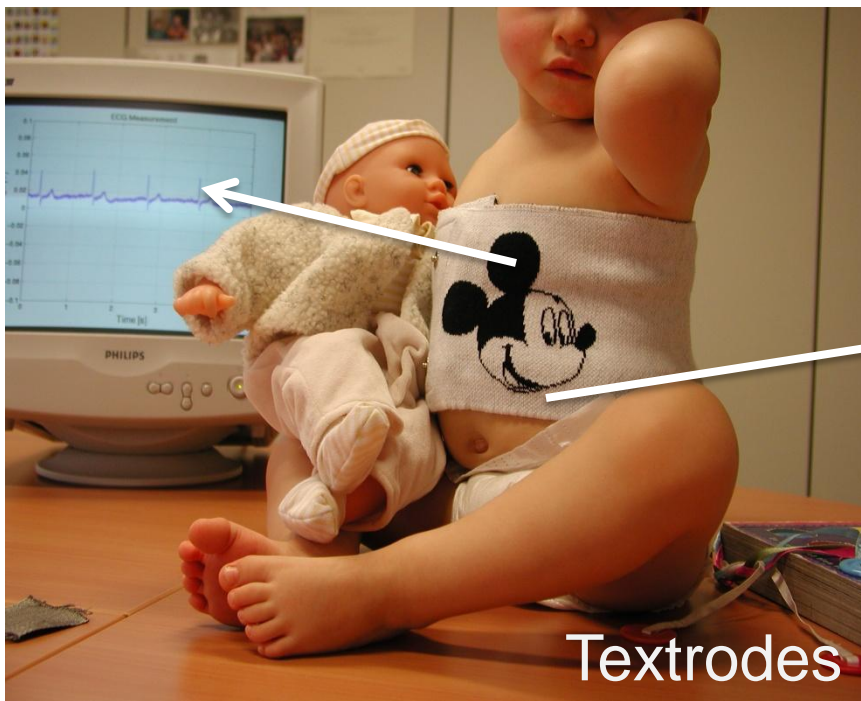
Mechanical strength

Odour

Acoustic

Biological

# Conductive textiles as sensor



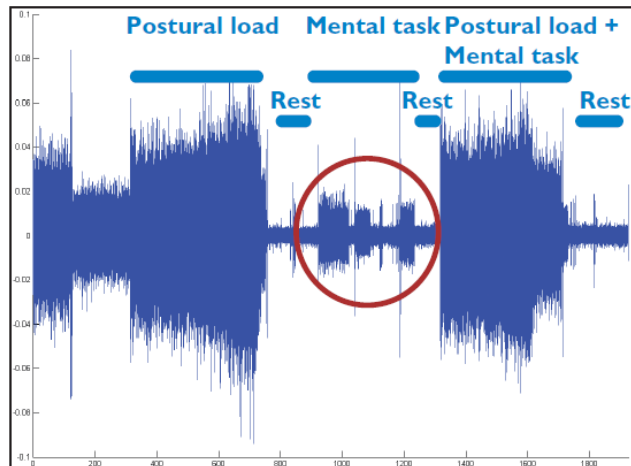
Respibelt

# EMG monitoring

Myography for stress measurement

Contactless

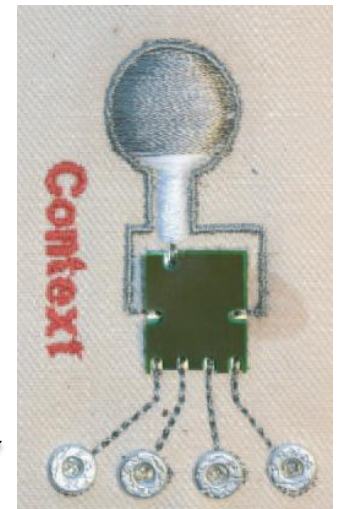
Professional use



EMG sensors

embroidered

laminated



([www.context-project.org](http://www.context-project.org))

# Electrotherapy

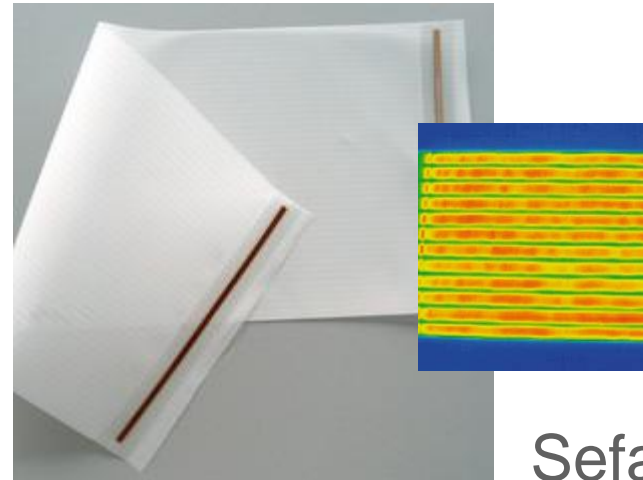


- Tactile stimulus
- Skin stimulation
  - Tissue reinforcement
  - Sensory effects
- Muscle stimulation
  - Warming up
  - Exercising
- Drug delivery
  - Skin permeability
  - Iontophoresis

# Heating



Polar



Sefar

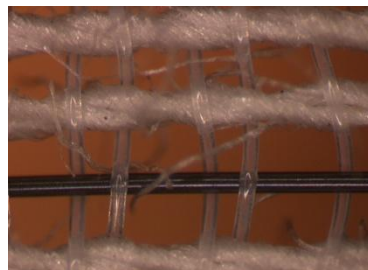
# Cooling

- Grado Zero F1 pilots
- Prospie project:
  - Salts that cool when wetted
  - Ventilation in clothing
  - Phase change materials

[www.prospie.eu](http://www.prospie.eu)



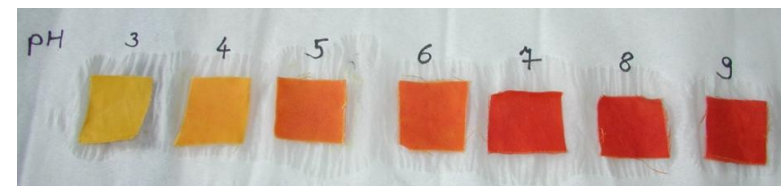
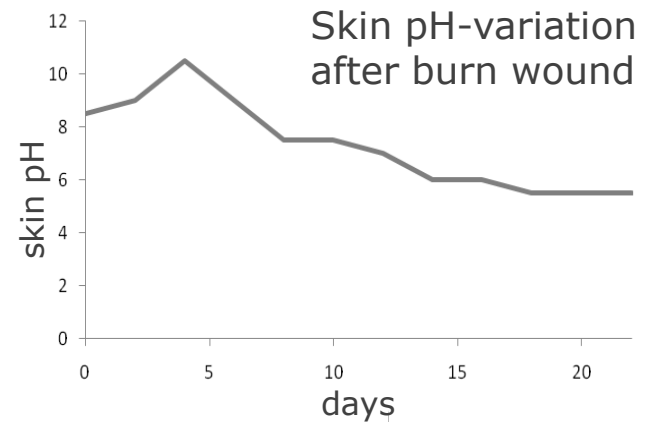
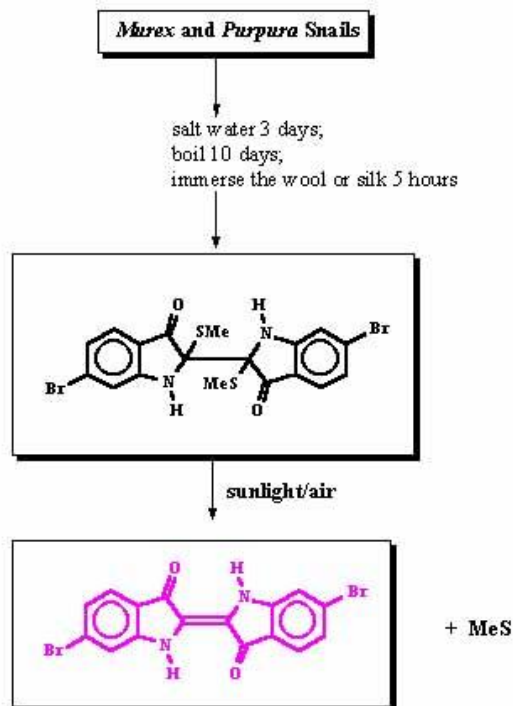
# Shape memory alloys: Nitinol



Goes to a predefined shape above transition temperature

Grado Zero  
Self ironing shirt

# Smart interface: active dyes



L. Van der Schueren, K. De Clerck

# No BUG against mosquitoes NO BUG

## Problem 1:

Efficacy and lifetime of current bio-repellent textiles is too short.

➡ Novel release concepts will be elaborated.

## Problem 2:

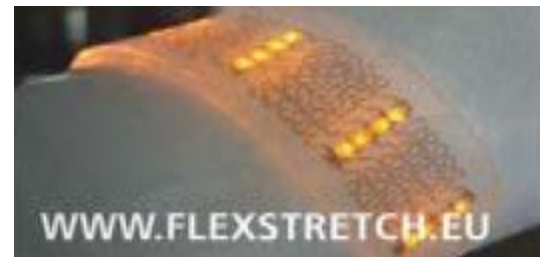
Current mosquito repellents are harmful, resistance to conventional repellents increases.

➡ Novel natural repellents for mosquitoes will be exploited.

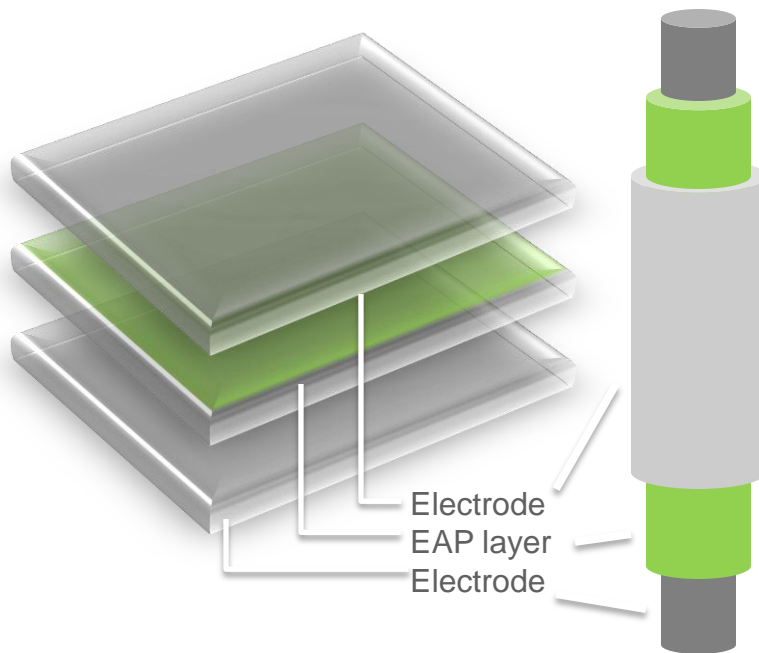
[www.no-bug.info](http://www.no-bug.info)



## Built in LED



# Electroactive textiles

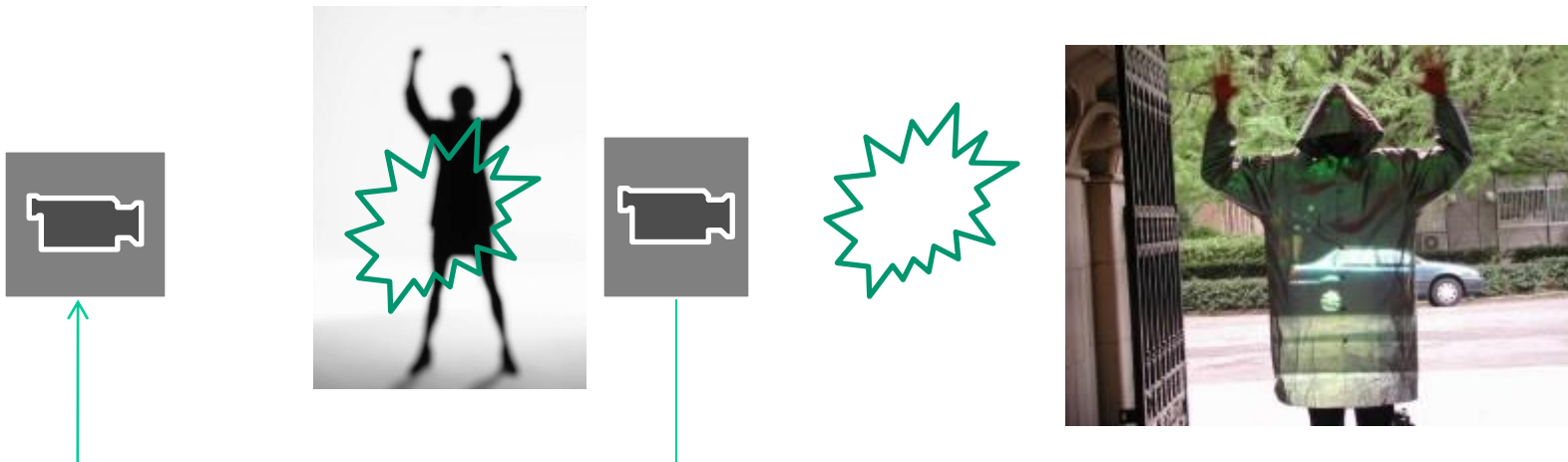


Artificial muscle  
Energy scavenging

- from light
- from motion

Illumination

# The invisible man



# Communication

Within components

Between components in a suit

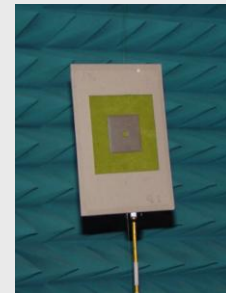
- Conductive fibres
- Optical fibres

With the wearer:

- keyboard,
- display

Wide environment:

- inductive,
- antenna



# Energy

Optimise consumption and distribution

Balance between storage and “generation”

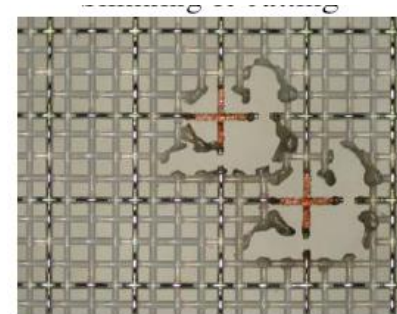
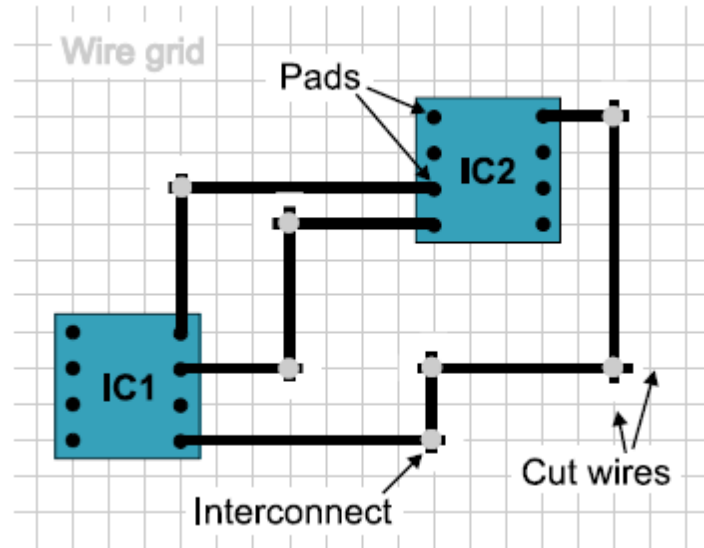
Storage:

- Flexible chemical batteries
- Capacity based fibre batteries

Generation from:

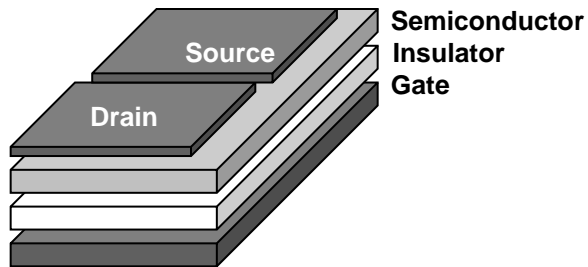
- Heat
- Motion
- Light

# Creating the paths: Sefar

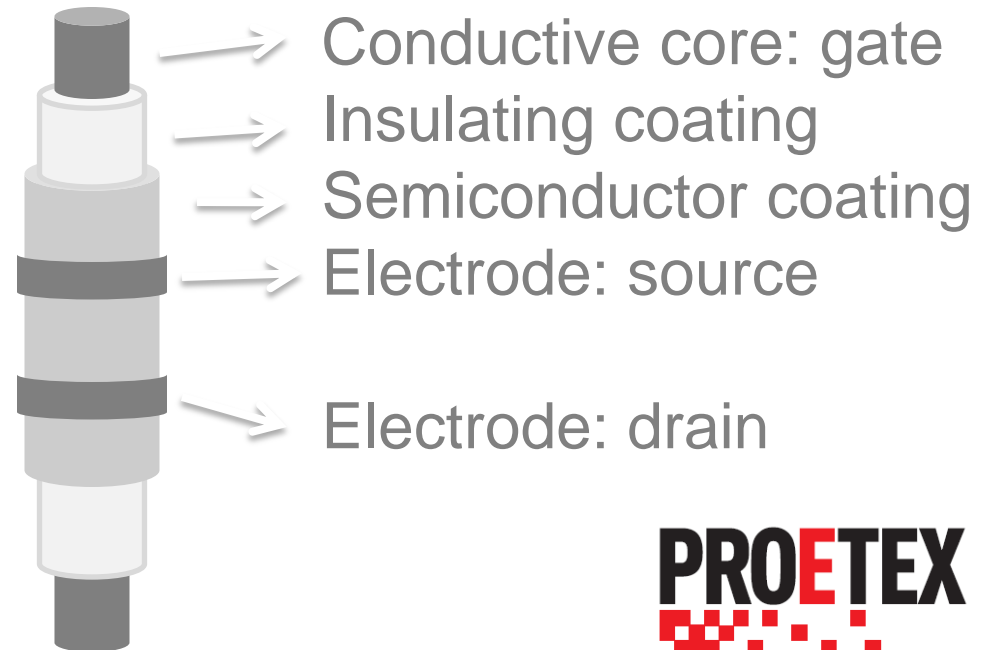




# Fibre transistor

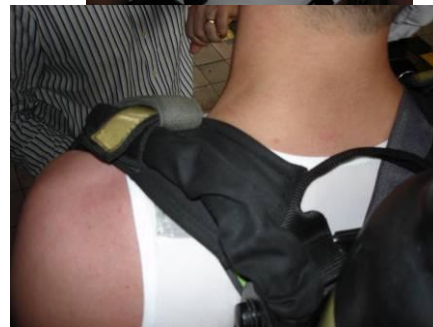


OFET: organic  
field effect transistor



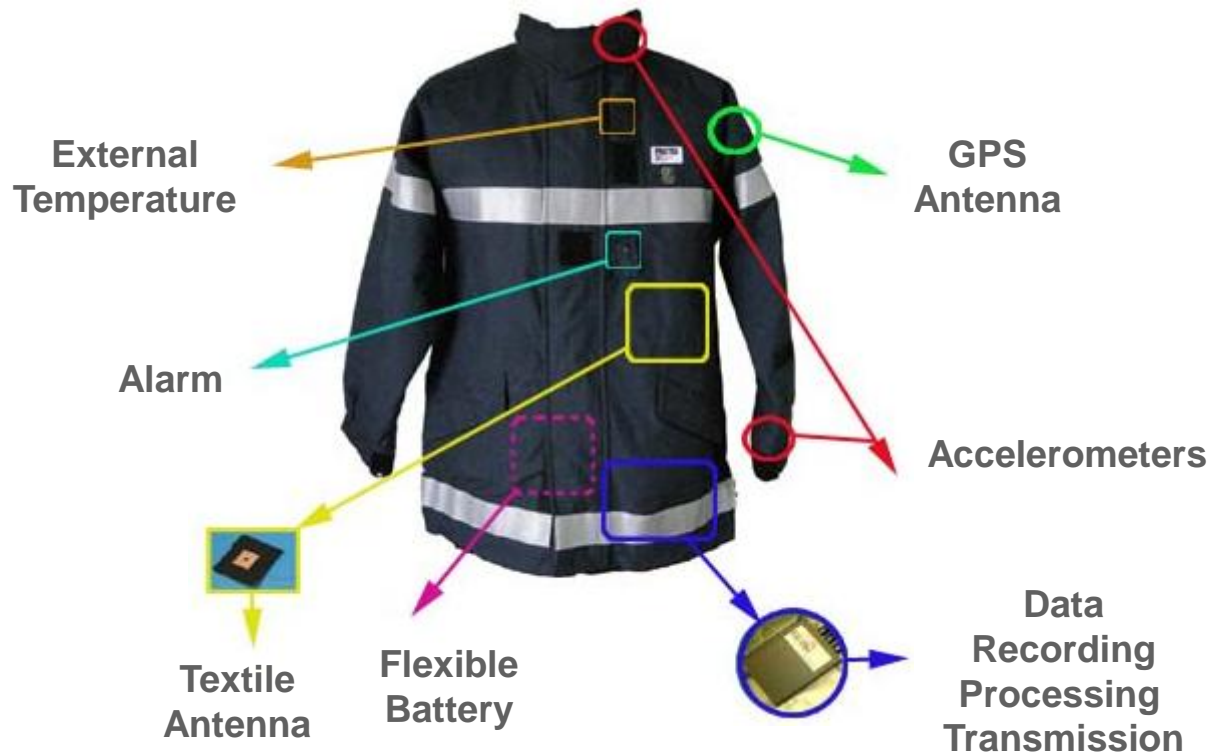
**PROETEX**  


# Inner garment





# Outer garment





## Victim patch



### Parameter

- Heart beat rate
- Respiratory rate
- Body Temperature

Cfr. inner garment

## A smart textile can ...

Monitor man, the environment and itself

Detect unusual conditions, warn, prevent and protect

Support in rehabilitation

Fully shield a person from the environment

Shield the environment from the man



Coordination action for enhancing the breakthrough of intelligent textile systems (e-textiles and wearable Microsystems)

[www. \*\*systemeX\*\*.org](http://www.systemeX.org)

- Research coordination
- Data base
- Platform for contacts

Join us!