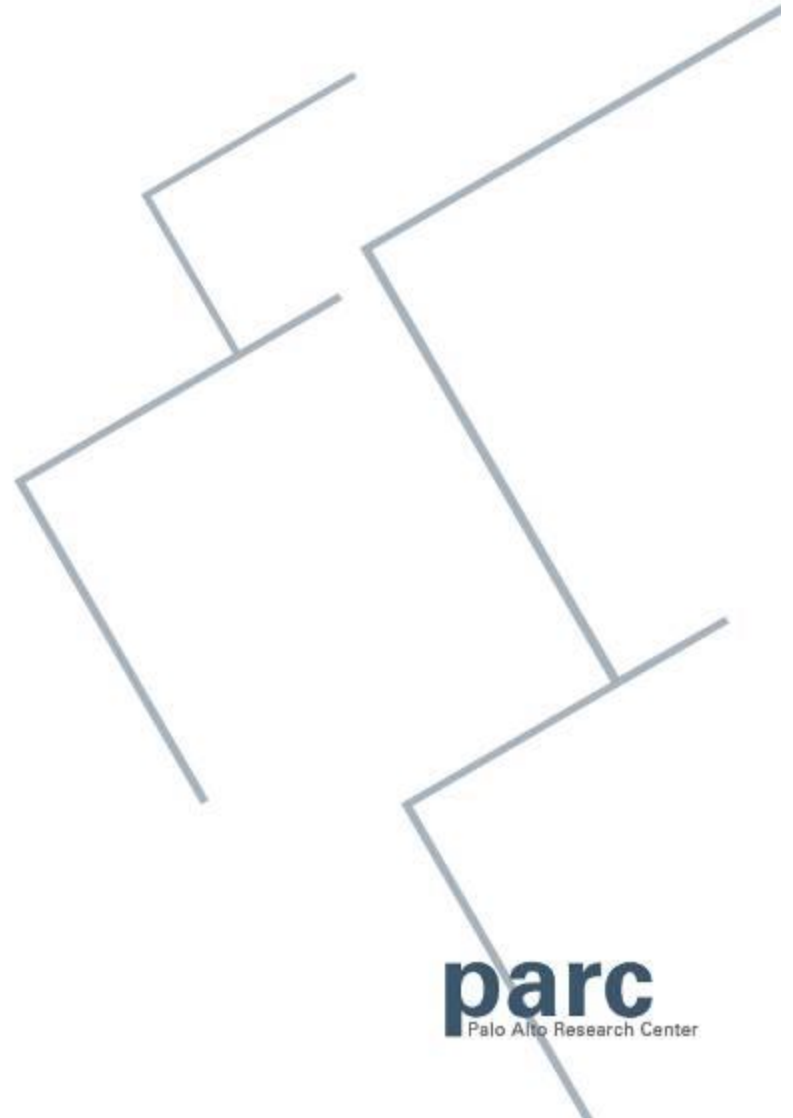


# Flexible electronics

Bob Street

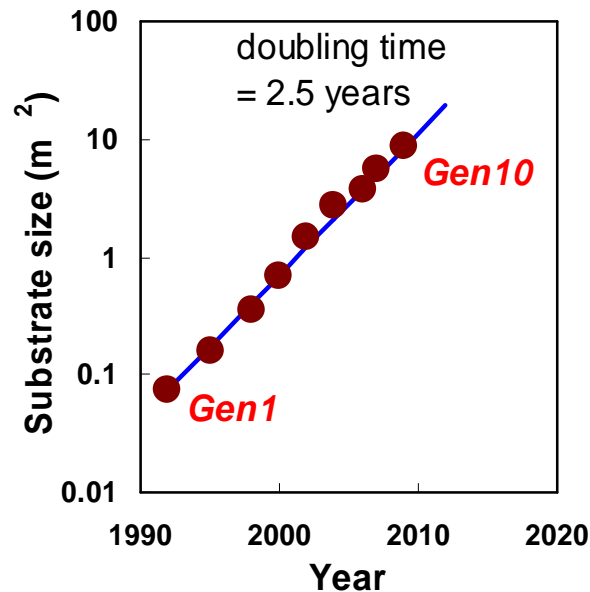
Senior Research Fellow  
Palo Alto Research Center



# Future displays

## Current displays

- n Conventional processing on glass substrate
- n Cost reduction by scaling to large size
- n \$100B business

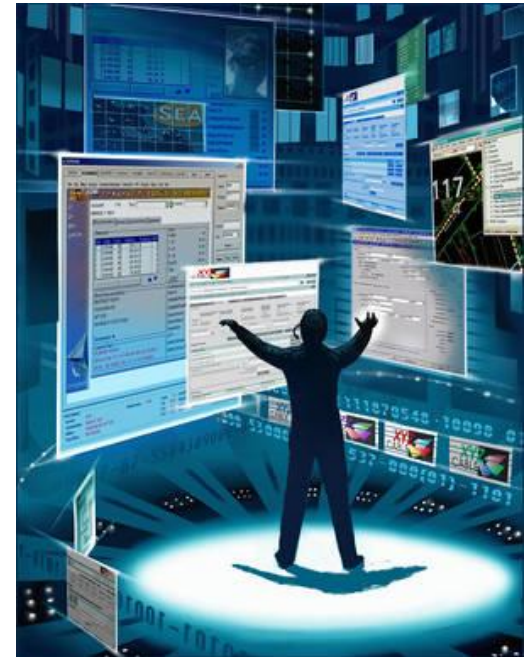


## Key challenges

- n Changing the manufacturing/cost paradigm
  - Lithography → digital printing
  - Batch processing → roll-to-roll
  - Glass → flexible substrates
  - Vacuum → solution deposition in ambient
  - High performance materials
  - Green technology

## Attributes of future displays

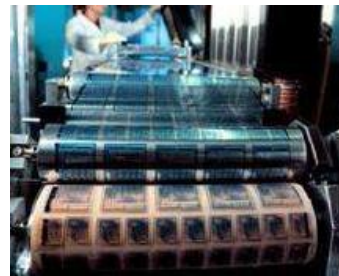
- n Multifunction, Embedded, Flexible, Portable



<http://www.donnarosenartists.com>

# Why flexible electronics?

- n Rugged, light weight, roll-up
  - E-paper, portable displays,
  - Solar cells
  - RFID tags, smart cards, etc
  - Unbreakable x-ray imagers
  - Security systems
- n Roll-to-roll manufacture
  - Low cost electronics
- n Conformal and stretchable
  - medical diagnostic sensors and therapeutic patches
  - Retinal camera
  - Shaped devices



PolyIC RFID tag



Nokia concepts



Polymer vision  
RADIUS

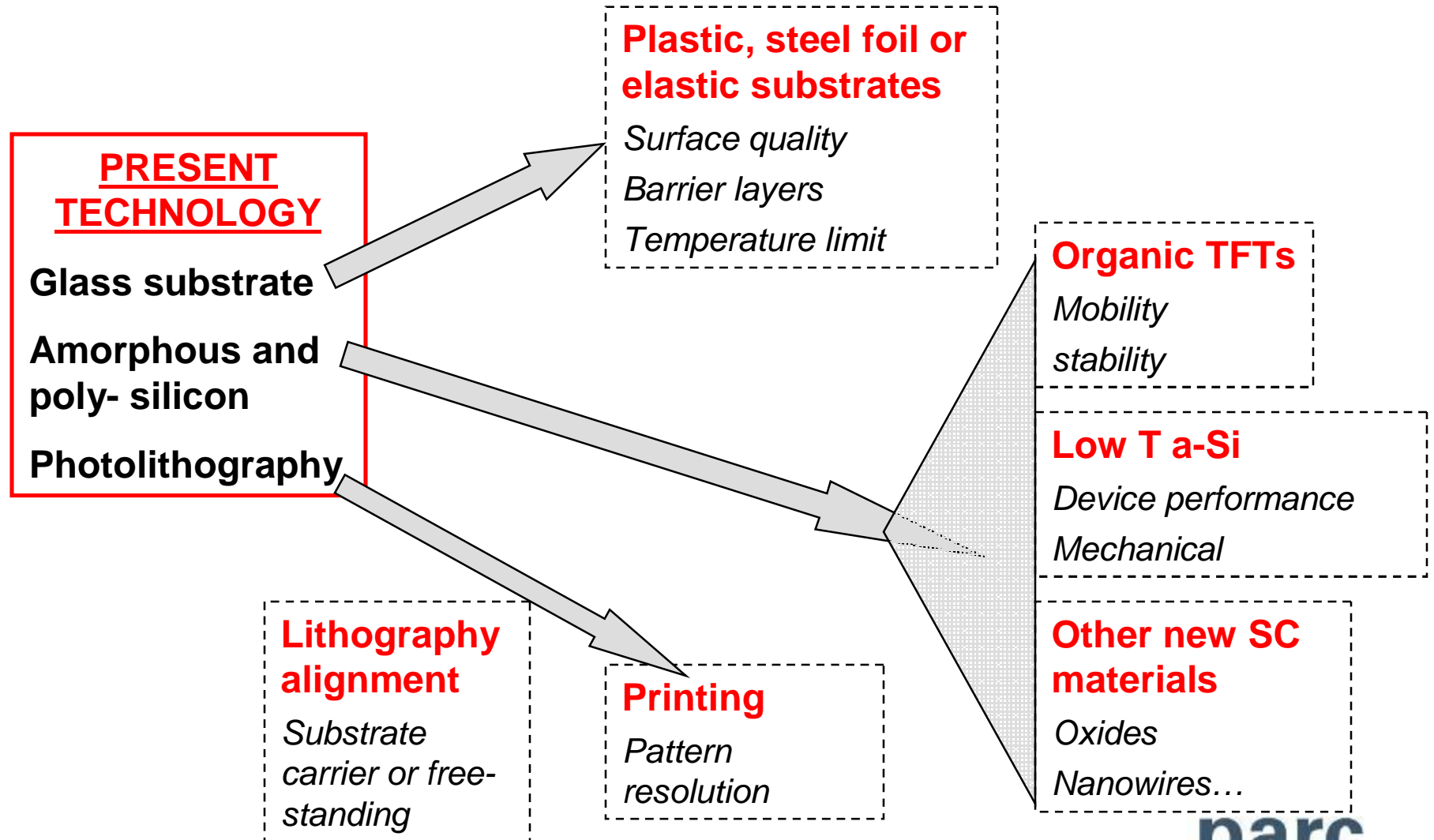


Plastic Logic Reader

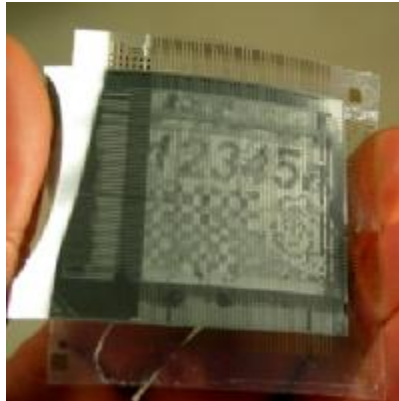
**parc**  
Palo Alto Research Center

# Research challenge

## Many materials issues



# Some examples of flexible electronics at PARC



Jet-printed polymer transistors on plastic

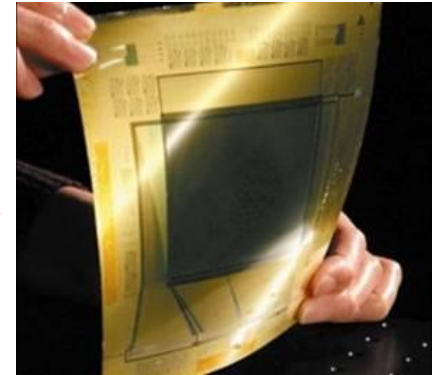
Display media: E-ink electrophoretic imaging film

*Paper-like displays*

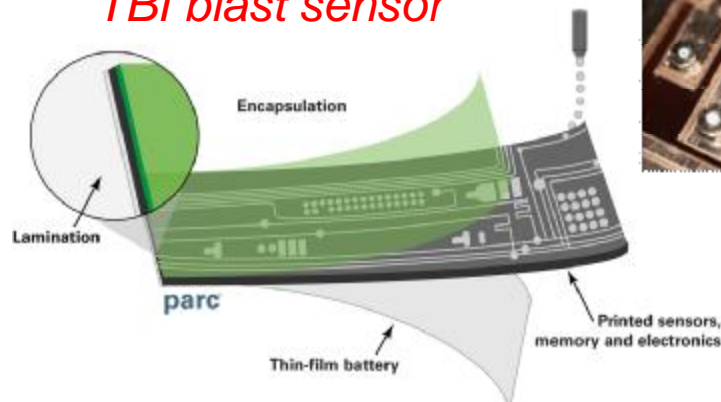


a-Si TFTs on PEN

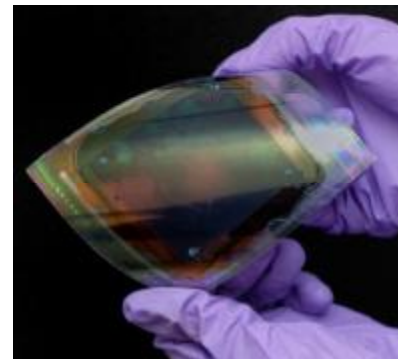
*p-Si organic light emitting diode display on steel foil*



*Flexible printed sensors; TBI blast sensor*

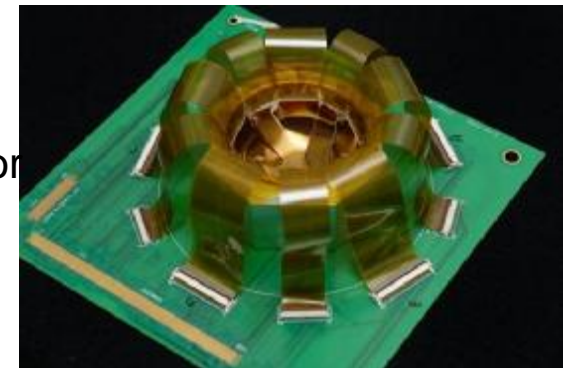


*Image sensors*



Polymer image sensor on plastic

Curved a-Si image sensor on plastic



# What needs to be done

- n Be (stay) ahead in materials research
- n Assist the transition from research to manufacturing
- n Compete with Asia and Europe
  - Asia display manufacturing draws in new technology
  - Europe gives strong support to solar and printed flexible electronics

New technology;  
Universities, start-ups etc

Materials suppliers;  
Corning, 3M, Merck .....

Equipment manufacturers;  
Applied materials, etc

Display manufacturers;  
Samsung, Sharp, AUO,  
Philips