

Sensing and Awareness in Microsystems

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Stretchable Electronics –

From Hemispherical Imagers to Neural Monitors

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Summary

The Problem:

Conventional electronics are rigid, brittle and planar, thereby restricting application possibilities

The Solution:

New ways to use old materials enable soft, elastomeric and curvilinear electronics, with performance equal to conventional systems

The Opportunity:

Stretchable electronics can be used for many new classes of application, with important military implications



Stretchable, Curvilinear, Large Area, Rugged and High Perf.



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Si Nanoribbons from Bulk Wafers



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Si CMOS and Extreme Bendability





A Stretchable Form of Single Crystal Silicon





Stretchable Single Crystal Silicon – 'Wavy' Si on Rubber





Stretchable Silicon Integrated Circuits



— 0.5 mm

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Stretchable Silicon Integrated Circuits



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Science **320**, 507 (2008).



Stretchable Silicon Integrated Circuits





Curved Focal Plane Arrays for Wide FOV Imagers





Electronic Eye via Stretchable Electronics





Active Neural Sensors – ECoG Tapes (w/ Litt)



unpublished

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200 µm



Stretchable Electronics for Brain Monitoring (w/ Litt)



256 channels; 500 Hz sampling



Stretchable Electronics –

From Hemispherical Imagers to Neural Monitors

Semiconductor ribbons, membranes represent promising materials for unusual format electronics

'Wavy' versions of these materials enable stretchable electronics: bio-inspired designs and biomedical devices

Electronic eye cameras and neural monitors provide examples



Senior Collaborators

Prof. Y. Huang (Northwestern) – mechanics theory Prof. P. Ferreira (UIUC) – printer manufacturing systems Prof. B. Litt (U. Penn) – cardiac, neural testing



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