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#### Title

Developing a Better Guidewire for Breast Biopsy: BioGuideUCI

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# Developing a Better Guidewire for Breast Biopsy

–BioGuideUCI Henry Samueli School of Engineering  
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## GOAL

**Objective:** The development of a more stable and accurate guidewire for localization of nonpalpable breast lesions during biopsy

## BACKGROUND

Breast cancer, the second leading cause of death in women ages 40-55, is defined by excessive cell proliferation in the milk ducts and lobules. There are an estimated 232,340 new cases in 2013. The key to successful treatment of breast cancer is an accurate diagnosis, which consists of a biopsy following the visualization of abnormalities in breast tissue with mammography. Safer, more accurate devices for lesion localization during biopsy will improve survival rates because current procedures often extract samples that lead to inaccurate results [1,2].

## CURRENT LOCALIZATION DEVICES

Kopans Breast Lesion Localization Needle

X-Reidy Breast Lesion Localization Needle

Breast Lesion Localization Coil



### Limitations:

A functional guidewire will allow for a minimally invasive incision and a secure attachment to the tissue of interest. The designs shown above include a variety of options to address these requirements. However, they are all limited by the rigid structure of the insertion wire, which has been known to dislocate or even fracture during sample extraction.

## TIMELINE

### FALL

Contact Mentors  
Outline device requirements  
Develop initial prototype design

### WINTER

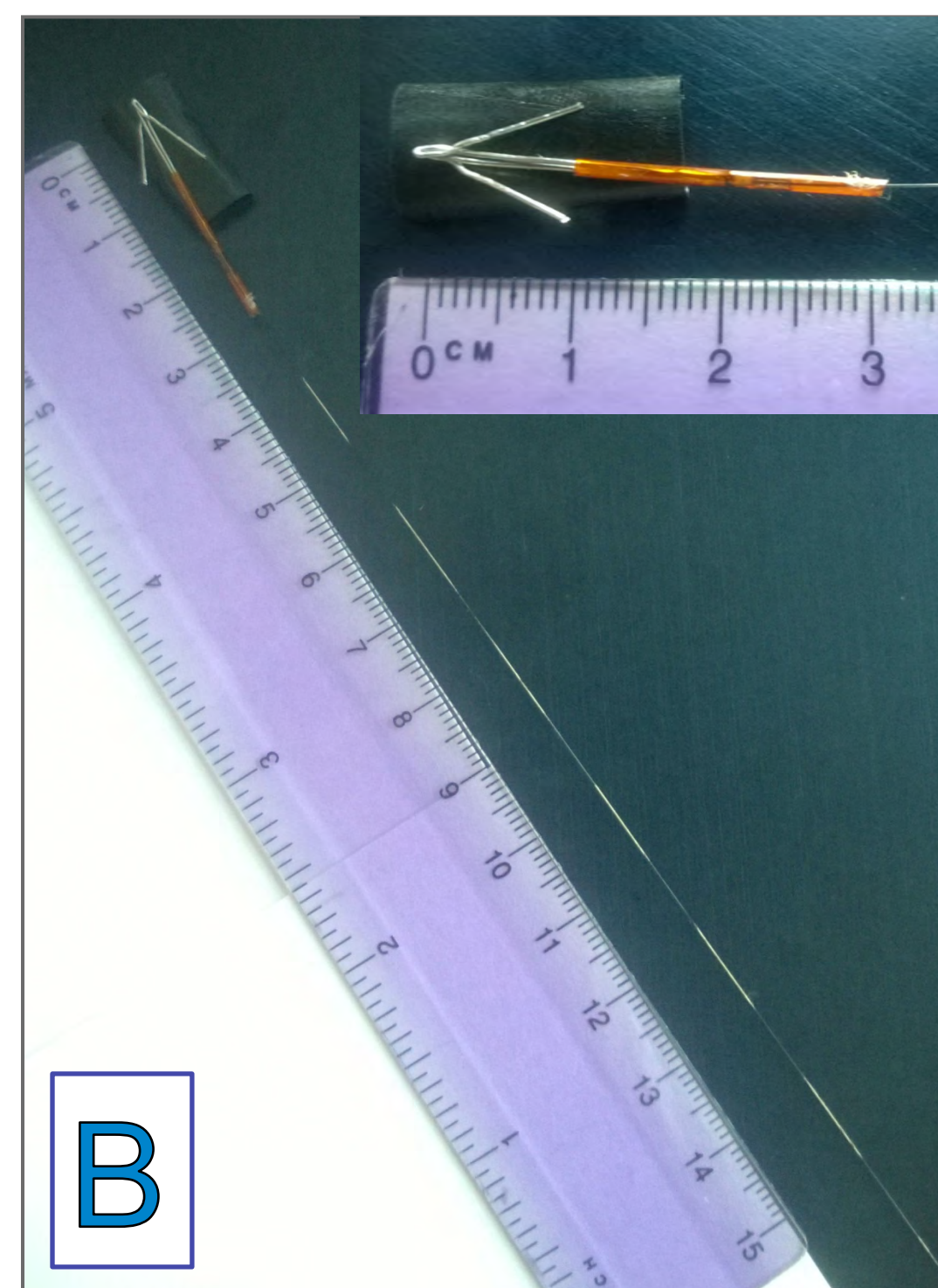
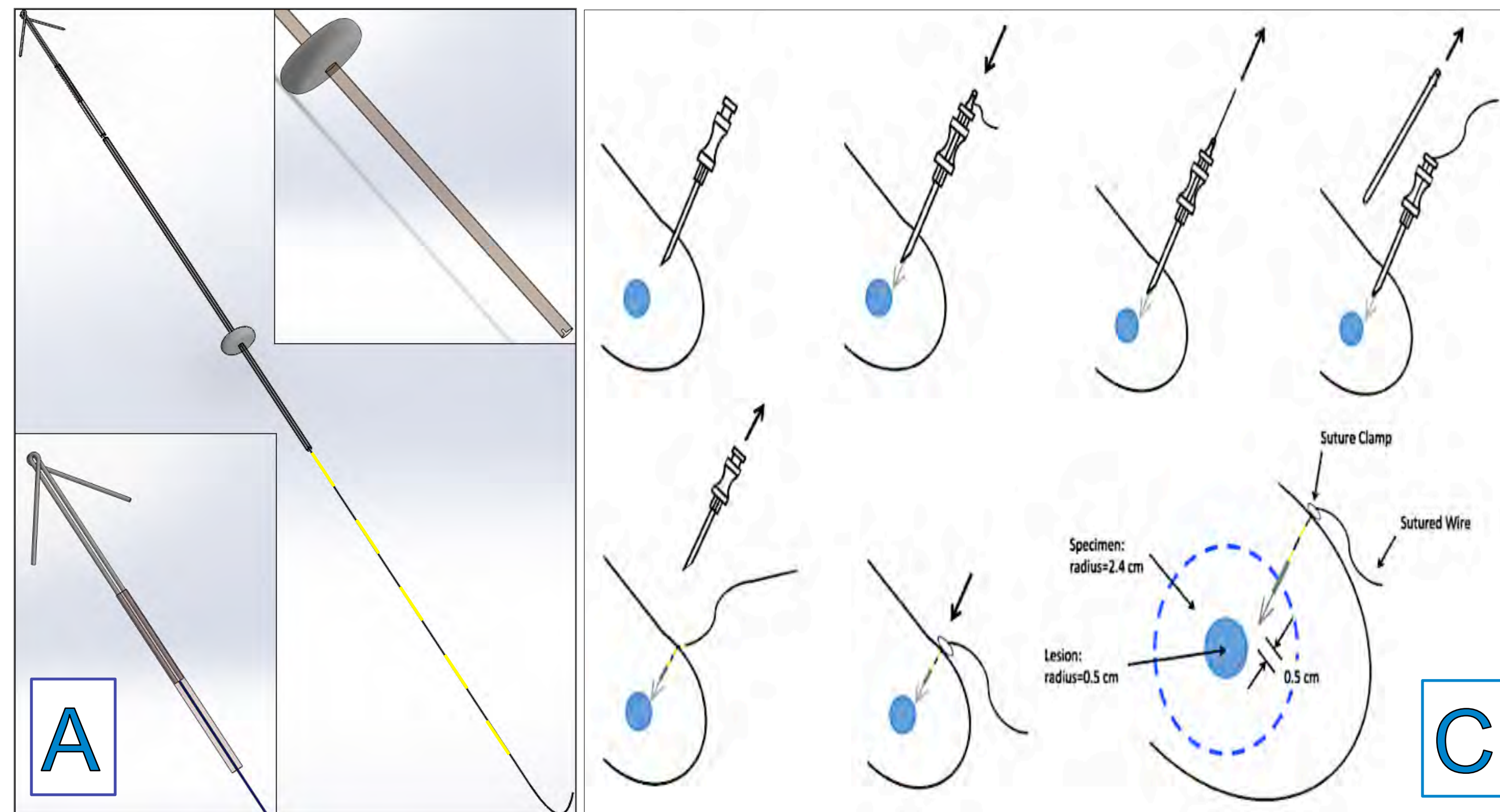
Obtain materials  
Build prototypes and update design  
Apply to design competitions  
Develop validation tests

### SPRING

Finalize prototype design  
Complete validation tests  
Showcase completed device

## PROPOSED DESIGN: S-WIRE

Components	Materials	Diameters (in)		Length (cm)
		ID	OD	
Needle	Stainless steel	0.17	0.135	4.9
Cannula	Polyimide	0.05	0.0403	6
Hook Region	Stainless steel	0.0157		2.5 wire + 0.5 hook
Suture	Nylon			20
Attachment sheath	Polyimide	0.05	0.0403	2
Adhesive + Contrast agent	Epoxy + Titanium Dioxide			
Incremented markers	Gold paint			1cm bands



A: Solidworks assembly of the S-Wire and cannula; double hook and attachment piece—lower left; epoxy stopper—upper right. B: S-Wire prototype; double hook and attachment piece—upper right. C: Schematic of localization procedure

### Value Proposition:

Replacing a portion of the wire with a suture will lower the risk of overheating and material degradation. Hooks will not be at risk of melting from the electric current of the coagulator since most of the metal will stay in the target tissue until surgical removal. Both the hook and suture will feature 1 centimeter markers that are visible in a mammogram to increase precision.

### Procedure:

- (1) Initial mammogram
- (2) Insert needle into compressed breast by mammogram and ultrasound guidance
- (3) Use cannula to thread S-Wire through needle
- (4) Remove cannula from needle
- (5) Remove needle and clamp suture in place at the skin surface
- (6) Take a second mammogram to confirm hook location
- (7) Relocate patient to surgery room for tissue extraction

## BIOGUIDEUCI TEAM



Left to Right: Aleksandar, Xiaoxuan, Joycelin, Nazneen, Hana, Sharon

Name and Major	Responsibility
Aleksandar Metulev ChemE/MSE	Materials & Finances
Xiaoxuan Zhang BME	Research & Writing
Joycelin Luc BME	Business Management
Nazneen Pashutanizadeh BME	Group Leader & Organizer
Hana Yamate-Morgan BME	Public Contact
Sharon Kuruvilla BME	Design & Manufacture

## ADVISORS

Mr. Richard Henson – Source Scientific  
Dr. David Hsiang – School of Medicine (Surgery)  
Dr. Michelle Khine – Biomedical Engineering  
Dr. Albert Yee – Chemical Engineering and Materials Science  
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## REFERENCES

- [1] R. Siegel, D. Naishadham, and A. Jemal, "Cancer Statistics, 2013," vol. 63, no. 1, pp. 11–30, 2013.
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