Background

- In US alone, there are 25.8 million people with Diabetes (8.3 % of the population)
- Rationale : finger stick method is still considered as the gold standard for glucose monitoring for diabetes Difficult for continuous monitoring : cost and convenience

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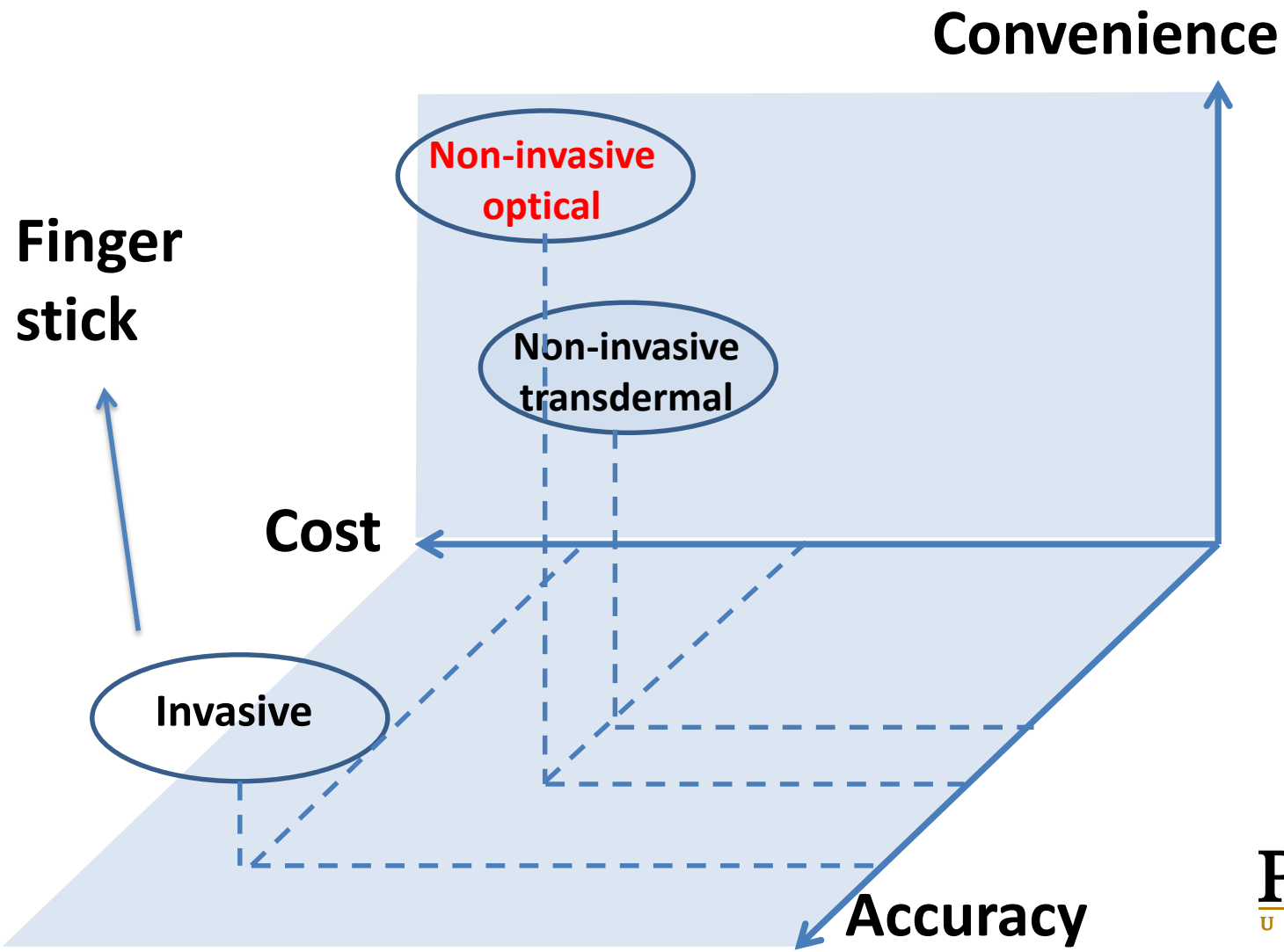
Background

- 3D plot of cost/convenience/accuracy



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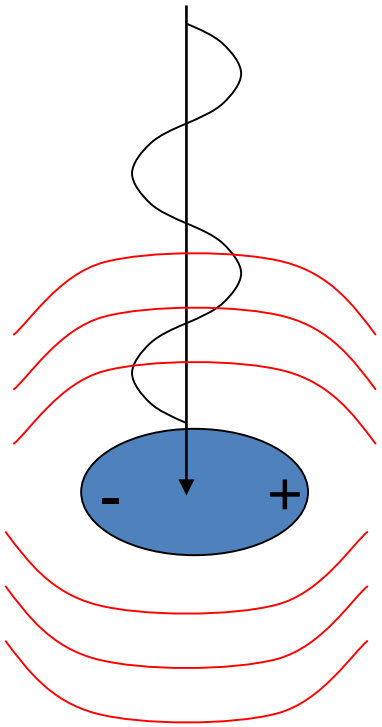
Optical methods in glucose monitoring

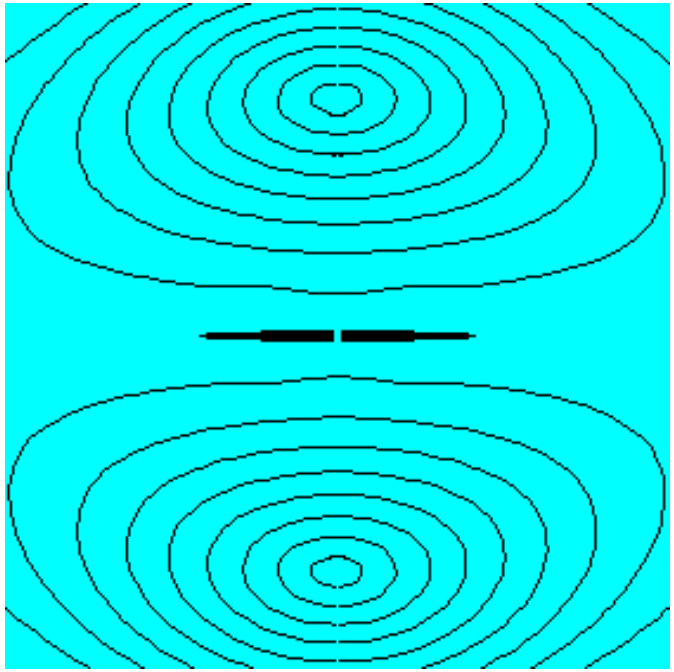
Method	Location	Strengths	Limitations
Fluorescence	Interstitial fluid (skin)	High specificity	Requires labeling
Kromoscopy [3]	Interstitial fluid (skin)	Four wavelength of NIR	Complicated setup
IR spectroscopy	Interstitial fluid (skin)	High specificity	Background scattering
OCT [4]	Interstitial fluid (skin)	High resolution	Not portable
Light Scattering	**Interstitial fluid (skin)**	**Simple design/portability**	**Low specificity**
Polarimetry	Anterior chamber	High sensitivity and specificity	Difficult for NCGM, safety issue to eye, complex design
Raman spectroscopy	**Interstitial fluid (skin)**	**High sensitivity and specificity**	**Background scattering**

Elastic light scatter (ELS)

- Scatter – Nuance of randomness/spread -> Mie (1904) analytical solution for spherical particles
- Physics of scattering – internal charge distribution from incident wave ($\mathbf{E_i}$) coupled with dipole polarizability (α) generates a electric dipole moments($\mathbf{P_i}$) and reradiates a secondary wave

$\mathbf{P_i} = \alpha \mathbf{E_i}$





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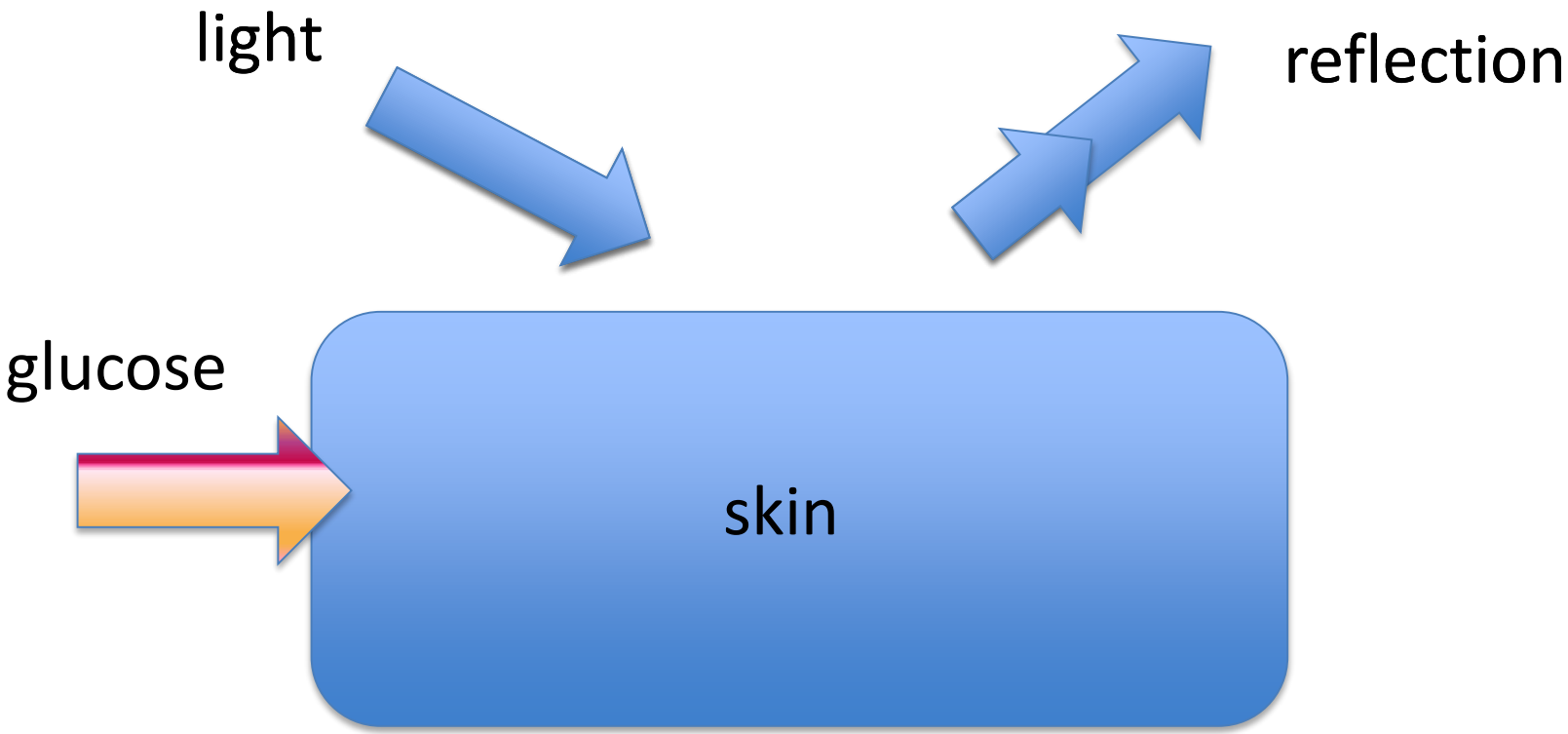
Glucose monitoring by ELS

Principle : in normal state, there are certain level of refractive index (RI) difference that scatters incoming light



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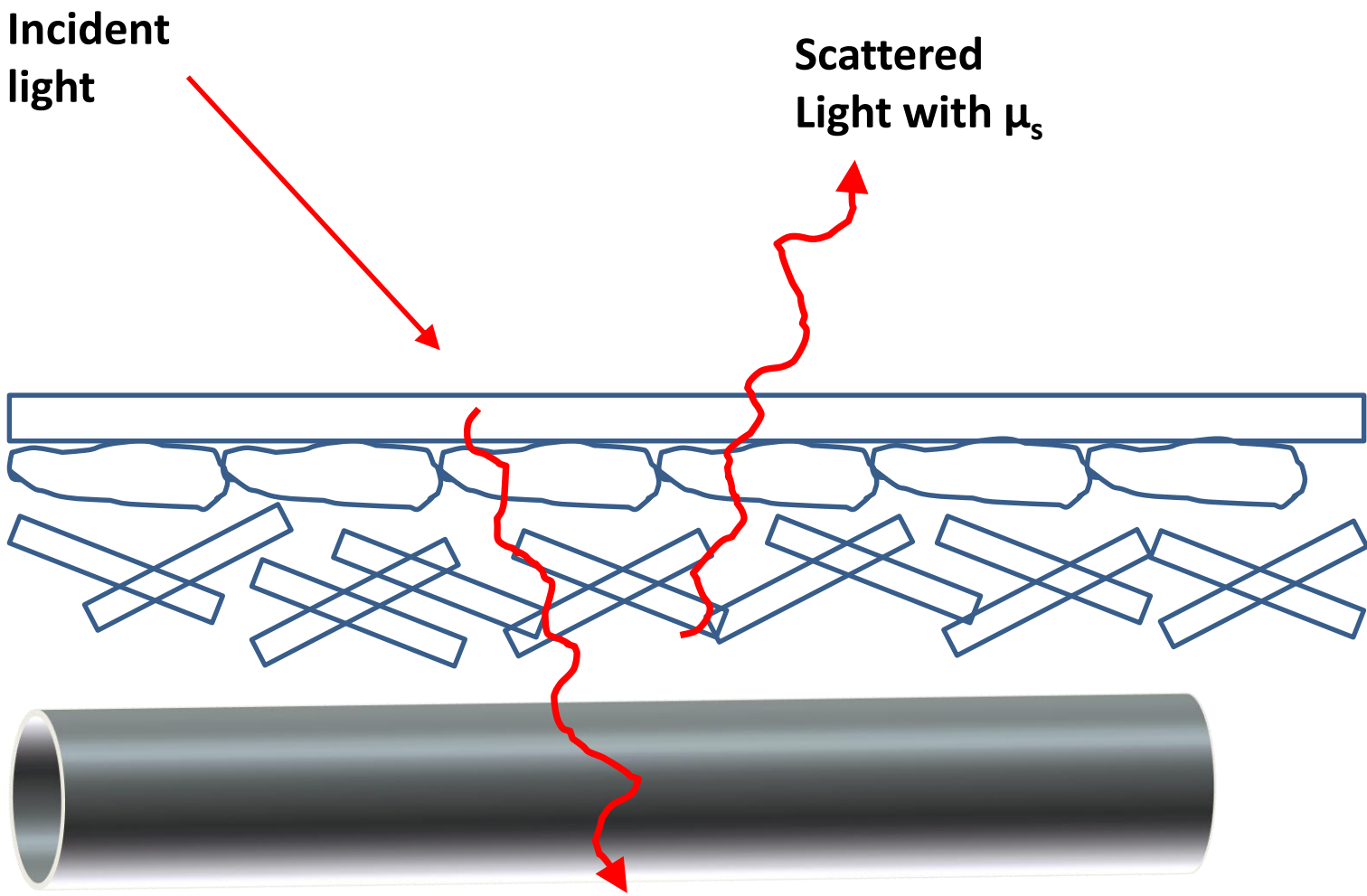
Glucose monitoring by ELS



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