

OUR VISION

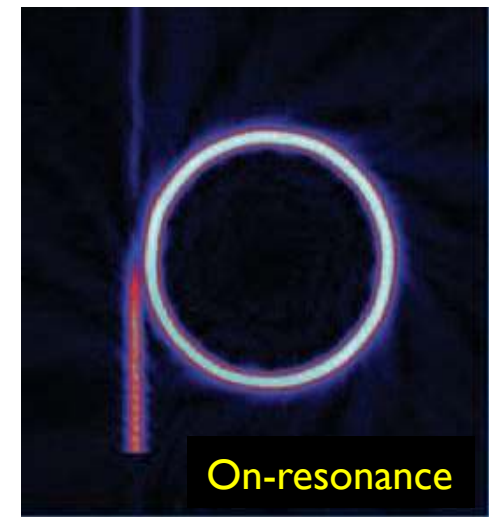
Establish a technology, business and education framework for industry, government and academia to accelerate the transition of integrated photonic solutions from innovation to manufacturing-ready deployment in systems spanning commercial and defense applications.

www.aimphotonics.com

Sensor project consortium

- Ben Miller (Lead; **University of Rochester**). Co-Personnel: Todd Stievater (**NRL**), Carl Meinhart (**UCSB**), Nate Cady (**SUNY-Poly**), Ray Jakubowicz (**Ortho-Clinical Diagnostics**), Skip Warren (**Ortho-Clinical Diagnostics**), Will Green (**IBM**), Eric Zhang (**IBM**), Chi Zhong (**IBM**), Ehsan Hosseini (**Analog Photonics**), Scott Holmstrom (**University of Tulsa**), Twan Korthorst (**PhoeniX**), Jason Guicheteau (**Army/ECBC**), Rick Stevens (**Lockheed-Martin Co.**), Mark Peterman (**OndaVia**)
- Intentionally draws from academia, DoD, large and small industry
- Also mixes expertise in different technology platforms and market spaces

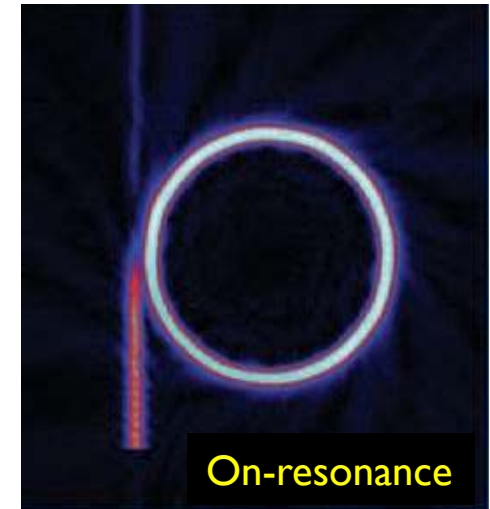
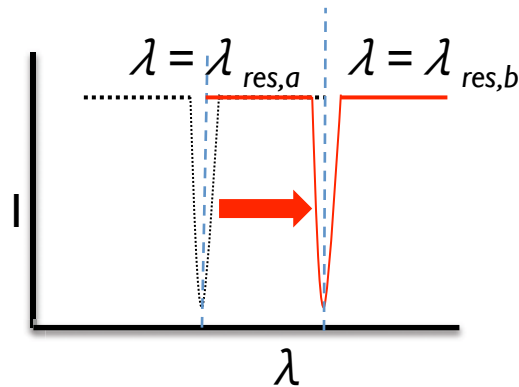
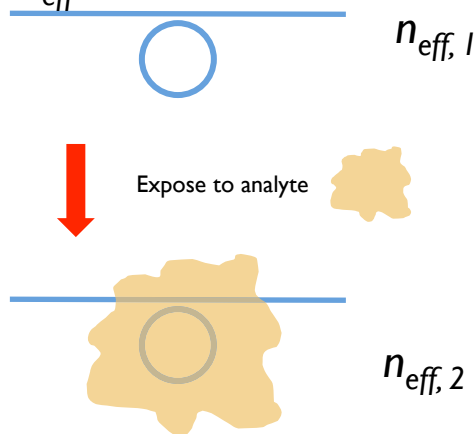
Ring resonators as biosensors

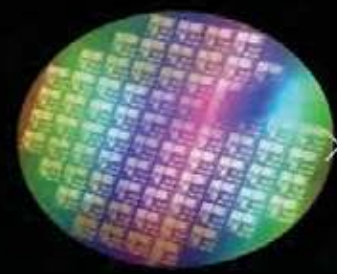
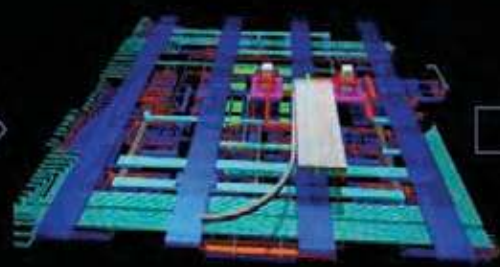
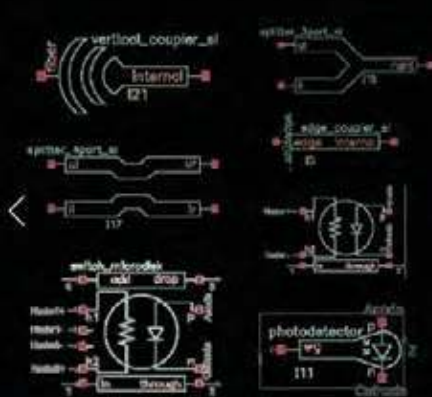


Ring resonators as biosensors

- Very well understood photonic element from telecom industry
- Potential for Si_3N_4 ring resonators to provide performance advantages

$$\lambda = 2\pi n_{\text{eff}} / m$$





Photonic
Design
Kit
(PDK)

Chip
Design

Multi-Project
Wafer
(MPW)

Test,
Assembly,
and Packaging
(TAP)

Albany NanoTech Complex

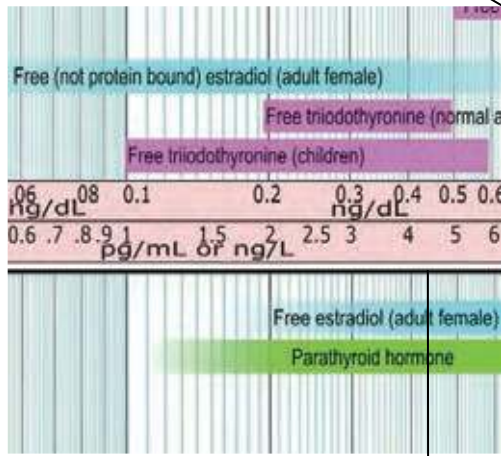
- 1.3 million Sq. Ft. facility with full 300 mm toolset
- 135,000 Sq. Ft. of class 10K and better cleanroom
- Wet labs, metrology labs and 3D packaging
- 65nm low power CMOS base line
- Leading edge lithography, etch and deposition
- Dedicated engineering staff



- *Years of proven results in Si photonics*
- *300mm wafer tools provide unprecedented quality photonics*

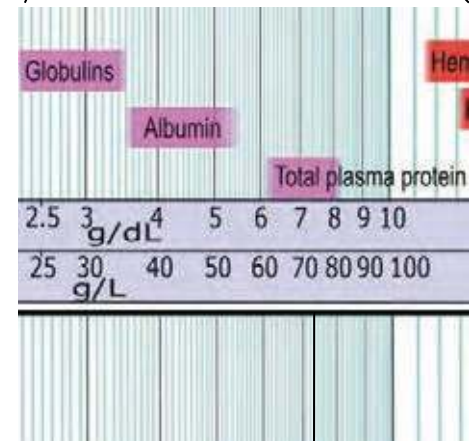
Human serum: needles in (wet) haystacks

Wikipedia: "serum reference ranges"



IL6 reference:
4.8 pg/mL

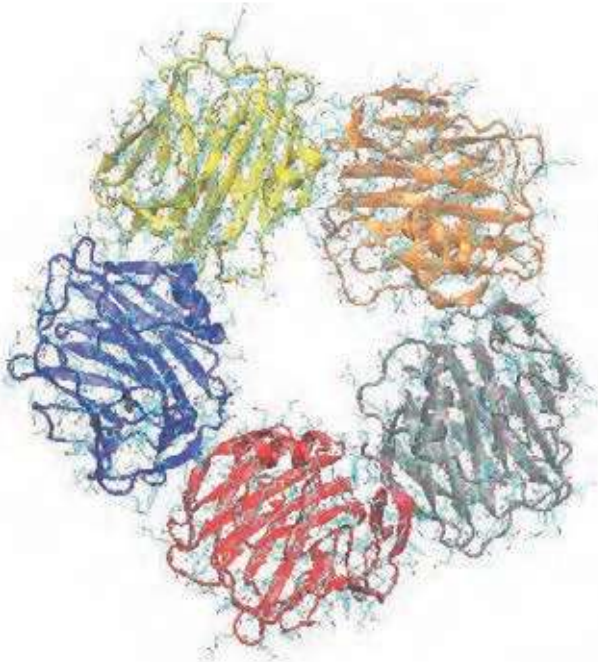
10^8 difference



Total protein:
70-80 mg/mL



Representative biological targets



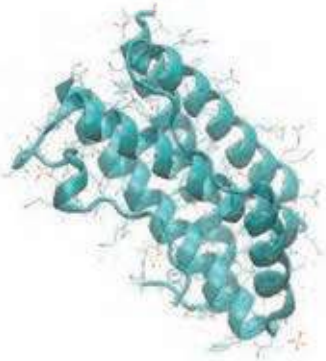
Human C-reactive protein

(PDB 1GNH)

Molecular weight: 25,106 (x 5)

Reference range: 0.8 – 3.0 ng/mL

- elevated in infection or inflammation to as much as 500 ng/mL



Human Interleukin-6

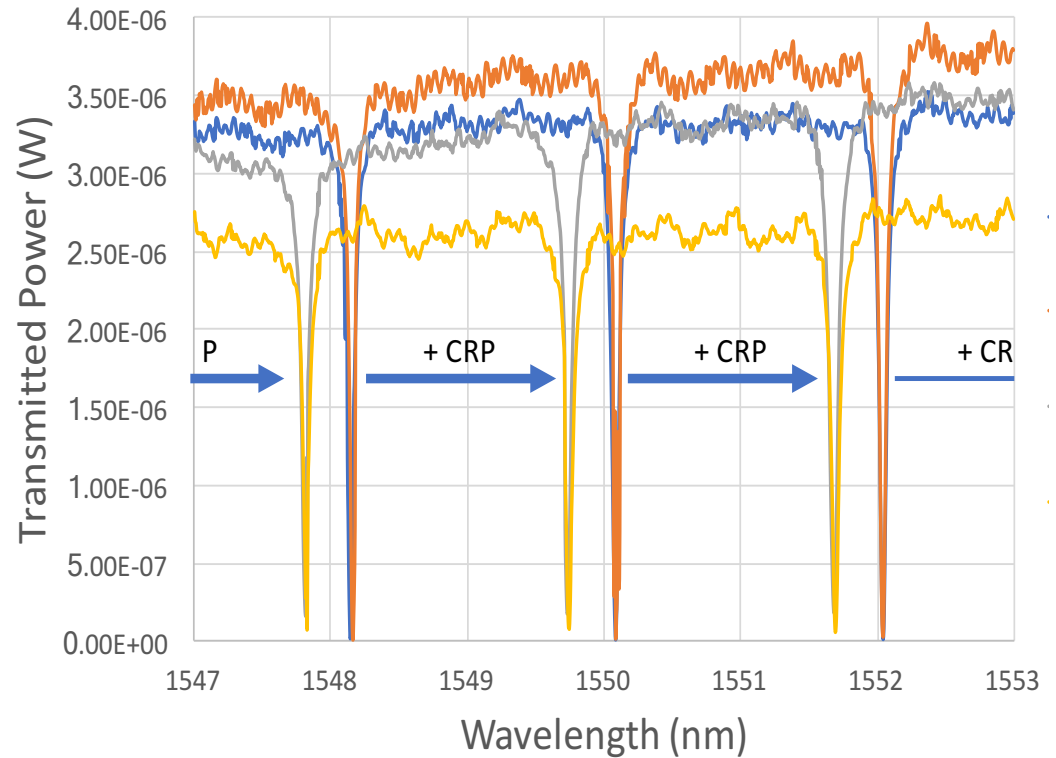
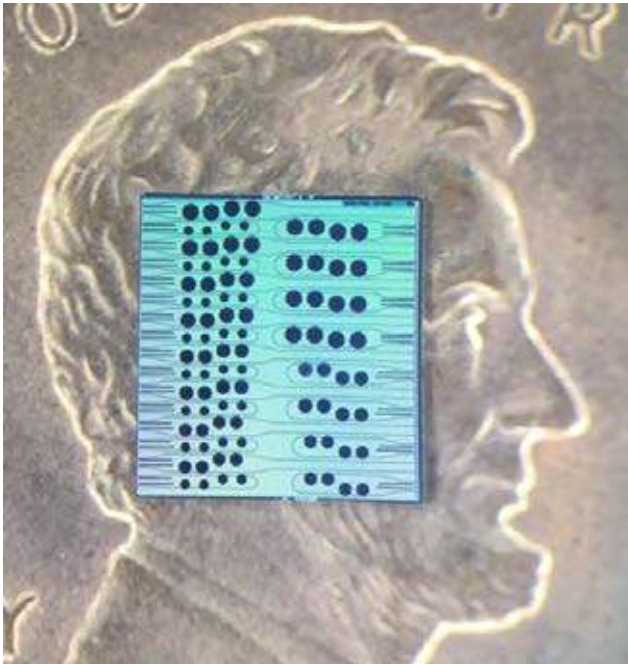
(PDB 1ALU)

Molecular weight: 21,000

Reference range: 4.8 pg/mL

- Elevated in infection or inflammation to as much as 250 pg/mL

Biosensing via functionalized microring resonators

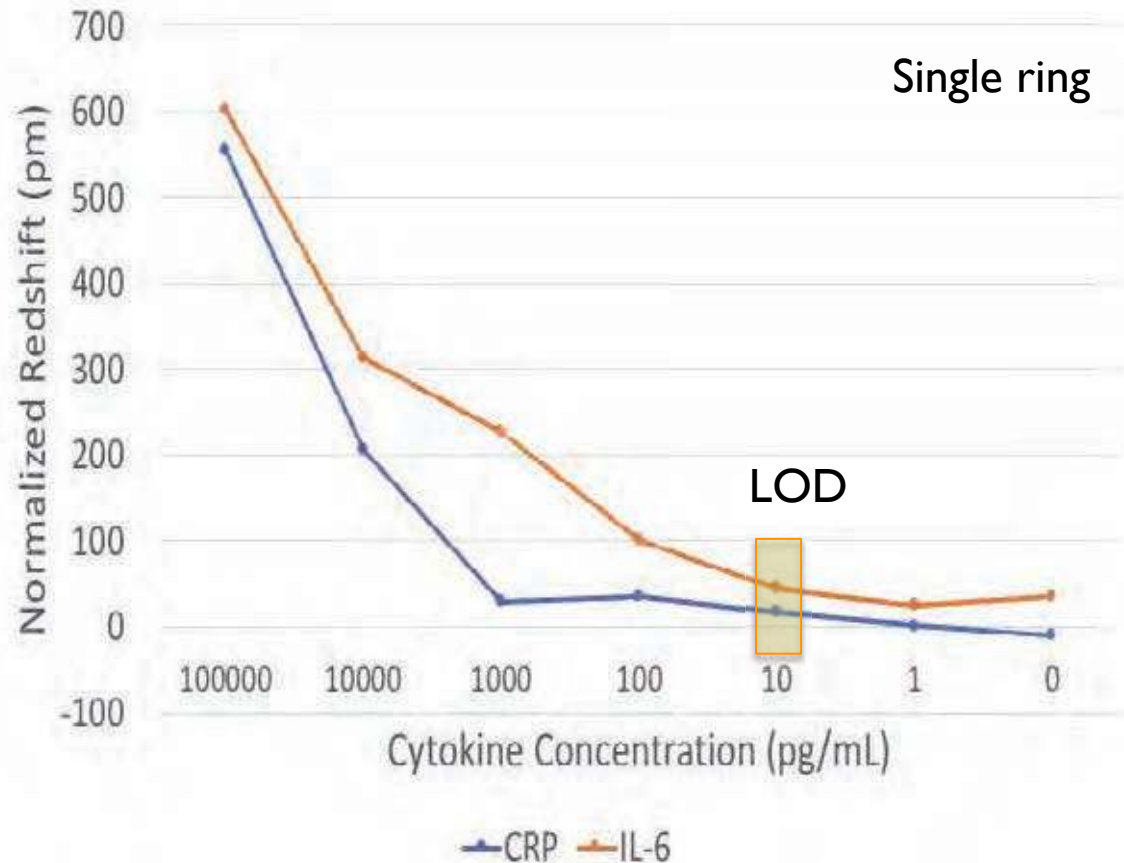


Ring resonator-based selective detection of C-reactive protein in bovine serum albumin background.

Data shows shifts for two replicate rings.

Quantitative detection of IL-6 and CRP in human serum

- Endpoint detection (incubate, rinse, dry, measure)
- All values are relative to an anti-FITC ring to normalize for nonspecific binding of serum (rather than using a cladded reference)



A pathway to address all market segments



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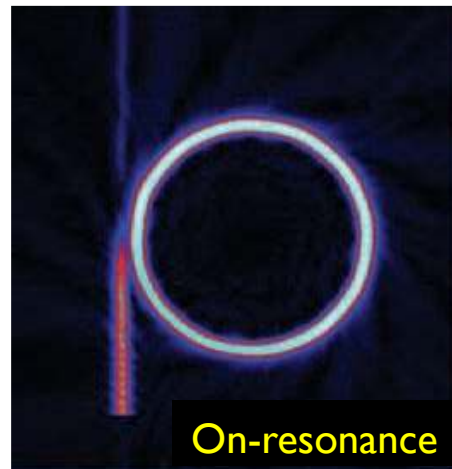
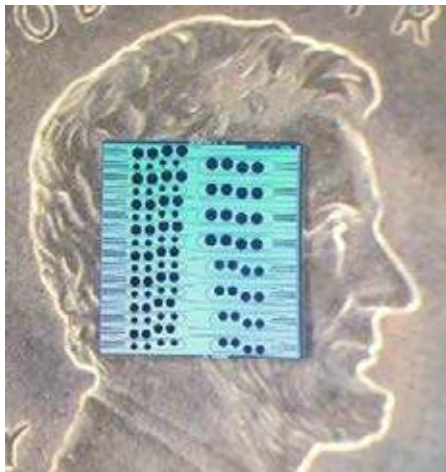


Benchtop/
Point-of-care/
Point-of-need



High-volume
Clinical lab

- Integrated photonic sensors represent a large and rapidly growing market
- Potential devices range from high volume / low cost to low volume / high value
- In the biosensing context, enable applications previously impossible
- We are making excellent progress in realizing this vision in collaboration with AIM Photonics



**WEBINAR #3
ADVANCED ELECTRONICS & SMART
CITIES**

Thursday, September 13th
9:00-10:00am EST / 3:00-4:00pm CEST

**WEBINAR #4
ADVANCED ELECTRONICS & ENERGY
SYSTEMS**

Thursday, October 18th
9:00-10:00am EST / 3:00-4:00pm CEST

www.fuzehub.com/webinar-electronicsb2b

Presenters



Alyson Slack
alyson.slack@esd.ny.gov
FuzeHub - Host



Win Thurlow
wthurlow@medtech.org
MedTech



LaMar Hill
lar.mar.hill@fusionmarketgroup.com
Fusion Market Group



Ben Miller
Benjamin_miller@urmc.rochester.edu
University of Rochester



Johan Lecocq
johan.lecocq@dspvalley.com
Silicon Europe Alliance



Sunil Gangadharan
Sunil.Gangadharan@imec.be
imec

View the Presentation

This presentation recording and PDF will be available tomorrow at:

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