CRIN Application Procedure

Eligibility – Domestic and 25% international for graduate students and postdocs combined (NCI R25T rules). If we fully enroll with 8 participants, 2 can be foreign. Initial enrollment may be only 6 participants so only 1 foreign participant will be allowed. For graduate students, 1st or 2nd year students are preferred along with more advanced students who have already taken a combination of biology and engineering/physical sciences courses. We expect initially to have 4 graduate students and 2 postdocs in the program. All Application materials are due Dec 7. We hope to have new participants appointed for winter quarter.

The following materials should be sent to both akummel@ucsd.edu and tjohnston@ucsd.edu

1. Identify two mentors: one clinical and one basic research who are CRIN faculty
2. Submit two short letters of recommendation (<1 page), one from each of the two mentors.
3. Submit three powerpoints for public disclosure (1) the proposed research (remove all intellectual property) (2) a CV (no GPA, GREs etc), and (3) summary of education plan.

4 Submit a ½ page educational plan and a ½ page research plan. For graduate students you need to show which courses you will take which provides cross training. See next slide for details. You are welcome to request substitution from the list of required courses.

5 You must promise in writing to attend CT2 lecture series, attend the Skaggs Nanomedicine lecture series, submit an F31 or supplement proposal to NCI by the end of year 1, and answer fairly detailed surveys required for evaluation of the program.

6 Submit a CV, an unofficial transcript, and unofficial GRE scores (GREs only for graduate students).

CRIN – Faculty and Projects

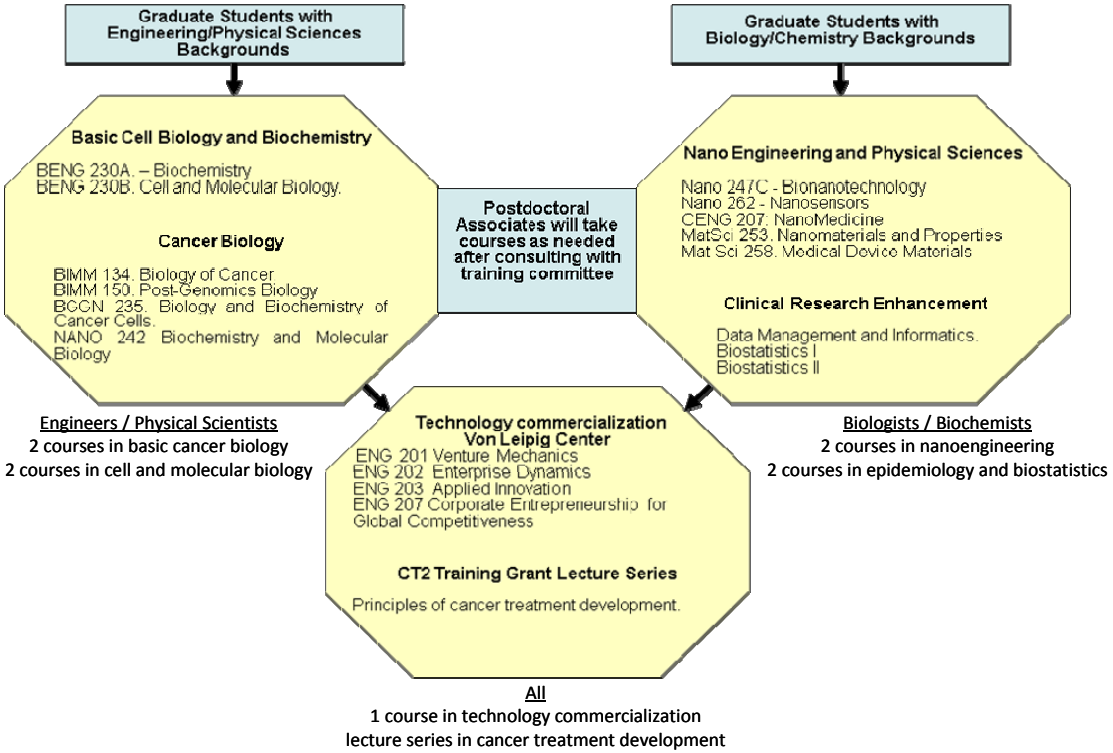
Theme A- Nanoparticle assisted drug delivery (directors Liangfang Zhang, Steve Howell). (1) BioChemically Triggered Nanoparticle: Liangfang Zhang (NanoE), Sadik Esener (NanoE), Jessica Wang Rodriguez (Pathology), and Dennis Carson (Medicine) (2) Nanoparticles to Overcome Drug Resistance; Liangfang Zhang (NanoE), Andrew Kummel (Chemistry), Steve Howell (Medicine), Roger Tsien (Pharmacology and BioChem), and David Cheresh (Pathology) (3) Inorganic Nanoparticles for Drug Delivery and Cancer William Trogler (Chemistry), Seth Cohen (Chemistry), Robert Mattrey (Radiology), and Steve Howell (Medicine) (4) Virus Based Immunotherapy Thomas Kipps (Medicine), Roger Tsien (Pharmacology and BioChemistry), and Mike Burkart (Chemistry)

Theme B- Guided Nanotherapies (directors Sadik Esener, Robert Mattrey) (5) Sound guided therapy Robert Mattrey (Radiology), and Sadik Esener (NanoEng); (6) Multifunctional Motherships: Sadik Esener (NanoEng), Robert Mattrey (Radiology); and Andrew Kummel (NanoEng & Chem); (7) Ultrasound-Deposited-Enzyme-Therapy Roger Tsien (Parmacology and Biochemistry), Sadik Esener (NanoEng), and Robert Mattrey (Radiology)

Theme C- Cancer Detection and Monitoring. (Directors William Trogler, Dennis Carson) (8) Detection of Cancer and Circulating Cancer Cells by ex-vivo Blood Analysis. Michael Heller (NanoEng), Sadik Esener (NanoEng), Dennis Carson (Medicine), Thomas Kipps (Medicine), Tony Reid (Medicine), and Jean Wang (Biology). (9) Cancer Detection by nanotechnology enabled in vivo blood analysis: Sadik Esener (NanoEng), Michael Heller (NanoEng), Andrew Lowy (Surgery), and Dennis Carson (Medicine), (10) Cancer Detection by Ultrasound Imaging: William Trogler (Chemistry), Robert Mattrey (SOM), Sadik Esener (NanoEng), Andrew Lowy (Surgery), and Dennis Carson (Medicine),

Theme D- Emerging Technologies for Assisting Cancer Surgery. (Directors Andrew Kummel, Sarah Blair) (11) Automated or Enhanced Imaging for assisting pathologists Andrew Kummel (NanoEng, Chemistry & Mat Sci), Sarah Blair (Surgery), Jessica Wang Rodriguez (Pathology), and Robert Mattrey (Radiology); (12) Biomolecular Imaging for Microsurgery of metastatic disease: Roger Tsien (Pharmacology and BioChem), Michael Bouvet (Surgery), and Sarah Blair (Surgery); (13) Targeted Fluorescent Nanoparticles for Pancreatic Cancer Surgical Navigation: Michael Bouvet (Surgery), Liangfang Zhang (NanoEngineering), Sadik Esener (NanoEngineering-Photonics) and David Cheresh (Pathology); (14) Ultrasound contrast agents for lymph node imaging and surgical markers: Robert Mattrey (Radiology), Andrew Kummel (Chemistry, Materials Science), Williiam Trogler, and Sarah Blair (Medicine)

CRIN EDUCATION PLAN



There will be two tracks for course work one for biologists/biochemists and one for physical scientists/engineers to insure cross training. All trainees will have didactic training in nanomedicine technology commercialization and research ethics.

Courses Biologists/Biochemists: (a) two graduate courses in nanoengineering through the NanoEngineering program; (b) two graduate epidemiology and biostatistics courses through the NIH funded CREST program at the UCSD medical school

Engineers/chemists/physicists: (c) two quarter courses in cell and molecules biology offered by the bioengineering department; (d) two basic cancer biology classes through the UCSD biology department;

All Participants: Both groups of students and the postdoctoral associates will take courses in (e) advanced cancer biology and translational medicine through a lecture series.

CRIN – Course Choices Part 1

(a) NanoEngineering and Physical/Biological Science Course Work

Nano 247C – Bionanotechnology: This is new course that covers nanodevices and biosensors for both clinical diagnostics and biowarfare (bioterror) agent detection; nanostructures for drug delivery; nanoarrays and nanodevices; use of nanoanalytical devices and systems; methods and techniques for modification or functionalization of nanoparticles and nanostructures with biological molecules. (new course)

Nano 262 – Nanosensors: This is new course that covers the principles and applications of sensors and biosensors based on the use of nanomaterials such as nanotubes, nanowires and nanoparticles. Special attention is given to transduction modes, various biorecognition elements, and the interface of the biological layer and the physical transducer. (new course)

CENG 207 – NanoMedicine: teaches the latest scientific developments and discoveries in the field of nanomedicine and the use of precisely engineered nanomaterials at the length scale of 1-100 nm to develop novel therapeutic and diagnostic modalities for medical applications. Use nanomedicine-centric applications to teach the underlying engineering principles such as the laws revolved around molecular and particulate transport, sorting and binding.

MatSci 253 – Nanomaterials and Properties: discusses synthesis techniques, processing, microstructural control, and unique physical properties of materials in nano-dimensions that include nanowires, quantum dots, thin films, electrical transport, electron emission properties, optical behavior, mechanical behavior, and technical applications of nanomaterials

Mat Sci 258 – Medical Device Materials: covers the nature, properties, and applications of various medical device materials will be discussed. The devices include coronary stents, catheters, drug delivery vehicles, and other implant, surgery, or therapeutics related devices.

b) Courses from the Clinical Research Enhancement through Supplement Training (CREST) program.

Data Management and Informatics: teaches the regulatory requirements and best practices for effective and accountable management of data in clinical research settings, and an appreciation for the tools and methods that can be applied to research data management in a hands-on computer laboratory setting. It also covers orientation to database design and management and key issues regarding data handling for clinical research and clinical trials.

Biostatistics I. Understand and apply the principles of measurement of clinical data, data types, and identification of statistical methods appropriate for analysis of a given clinical data set. Assemble clinical datasets in formats suitable for analysis by NCSS or other comparable statistical packages. Conduct graphical and numerical exploratory data analysis, comparative tests of categorical, ordinal and continuous data, linear and logistic regression analysis, and survival analysis by life table and Kaplan-Meier techniques.

Biostatistics II. Understand and conduct more advanced biostatistical analyses including: multiple linear and logistic regression, survival analysis and Cox and extended Cox regression. Familiarity with person-time rate analysis and Poisson regression and longitudinal data analysis in the presence of missing values and varying measurement times.

CRIN – Course Choices Part II

c) Basic Cell Biology and Biochemistry

BENG 230A – Biochemistry: this is a graduate course especially tailored to the requirements and background of bioengineering graduate students covering the important macro- and small molecules that are either the major constituents or that function as signaling molecules or are involved in molecular machineries in cells. The structures, pathways, interactions, methodologies, and molecular designs using recombinant DNA technology are covered.

BENG 230B – Cell and Molecular Biology:– is a general survey of structure-function relationships at the molecular and cellular levels. It places emphasis on basic genetic mechanisms, control of gene expression, membrane structure, transport and traffic, cell signaling, cell adhesion, mechanics of cell division, and cytoskeleton.

d) Cancer Biology

BIMM 134 – Biology of Cancer: covers basic processes of transformation and tumor formation in a two-part format. The first section is focused on molecular and cellular mechanisms of carcinogenesis. The second section discusses tumor pathology and metastasis.

BIMM 150 – Post-Genomics Biology: focuses on large-scale analysis of post-genomics biological systems. Students are introduced to methods for analyzing changes in gene expression, identifying protein-protein interactions, screening for pathway inhibitors, characterizing multiprotein complexes, and probing protein localization and function.

BGGN 235 – Biology and Biochemistry of Cancer Cells: covers recent advances in cell biology, biochemistry, immunology, and virology as they relate to cancer cells and their interaction with the host. Cancer research specialists from outside will be brought in to discuss the most recent evidence and interpretations in key areas of cancer research.

NANO 242 – Biochemistry and Molecular Biology: This course is designed to give nanoengineering students from a variety of backgrounds a working knowledge of biochemistry and molecular biology. While the course covers biochemistry basics and key themes in molecular biology, it will emphasize the role of engineering innovations. (new course)

CRIN – Course Choices Part III

e) CT2 Coursework Each course meets for 2 hours once a week for 10 weeks.

CT2 is a Lecture Series on Principles of Cancer Treatment Development. Topics include target Identification and validation, screening, structural modeling and design , Principles of GLP and GMP and toxicology basics, tumor models for preclinical testing, monitoring drug effect on target, pharmacogenomics, preparation and submission of an IND , phase I pharmacokinetic trials, phase II/III trials. Talks for the coming year include: (1) Tyrosine Kinases, Androgen Receptor and Prostate Cancer (Hsing-Jien Kung, UC Davis); (2) Immunology, Apoptosis, Autophagy, and Mitochondria: Life After Cytochrome c Release (Douglas Green); (3) Cellular Actions of Angiogenesis Inhibitors on Blood Vessels in Tumors and Normal Organs (Donald McDonald – UCSF); (4) Regulation of Tumor Angiogenesis by VEGF and Other Mediators (Napoleone Ferrara – Genetech); (5) Mechanisms of Oncogene Addiction: Dr. Jekyll and Mr. Hyde (Dean Felsher – Stanford); (6) Sequenom – Profiling Nucleic Acid Biomarkers in Cancer (Charles Cantor); (7) Functional Analysis of the BRCA1 Gene Product (David Livingston – Harvard); (8) A Malady of Genes (Inder Verma – Salk Insitute).

f) Coursework in technology commercialization through the Von Liebig center.

ENG 201 – Venture Mechanics: Provides a deep understanding of the core processes of innovation and new product/market development

ENG 202 – Enterprise Dynamics: teaches how to design, build, manage and grow innovative companies: It focuses on the CTO/VP level of an organization, which is the middle stage of an engineer's career. There is a strong emphasis on direct exposure to real firms via a major project and through an interactive computer simulation based business competition.

ENG 203 – Applied Innovation: teaches how to plan and build new business ventures: It focuses on the CEO/Governance level of an Organization including the later stage of an engineer's career as president or owner/founder of a high tech business venturing enterprise. The course concentrates on the development of real business plans in cooperation with real firms on new business projects.

ENG 207 – Corporate Entrepreneurship for Global Competitiveness: uses the medical device industry as an example to explore corporate entrepreneurship and the innovation process…

g) Plan for Instruction in the Responsible Conduct of Research

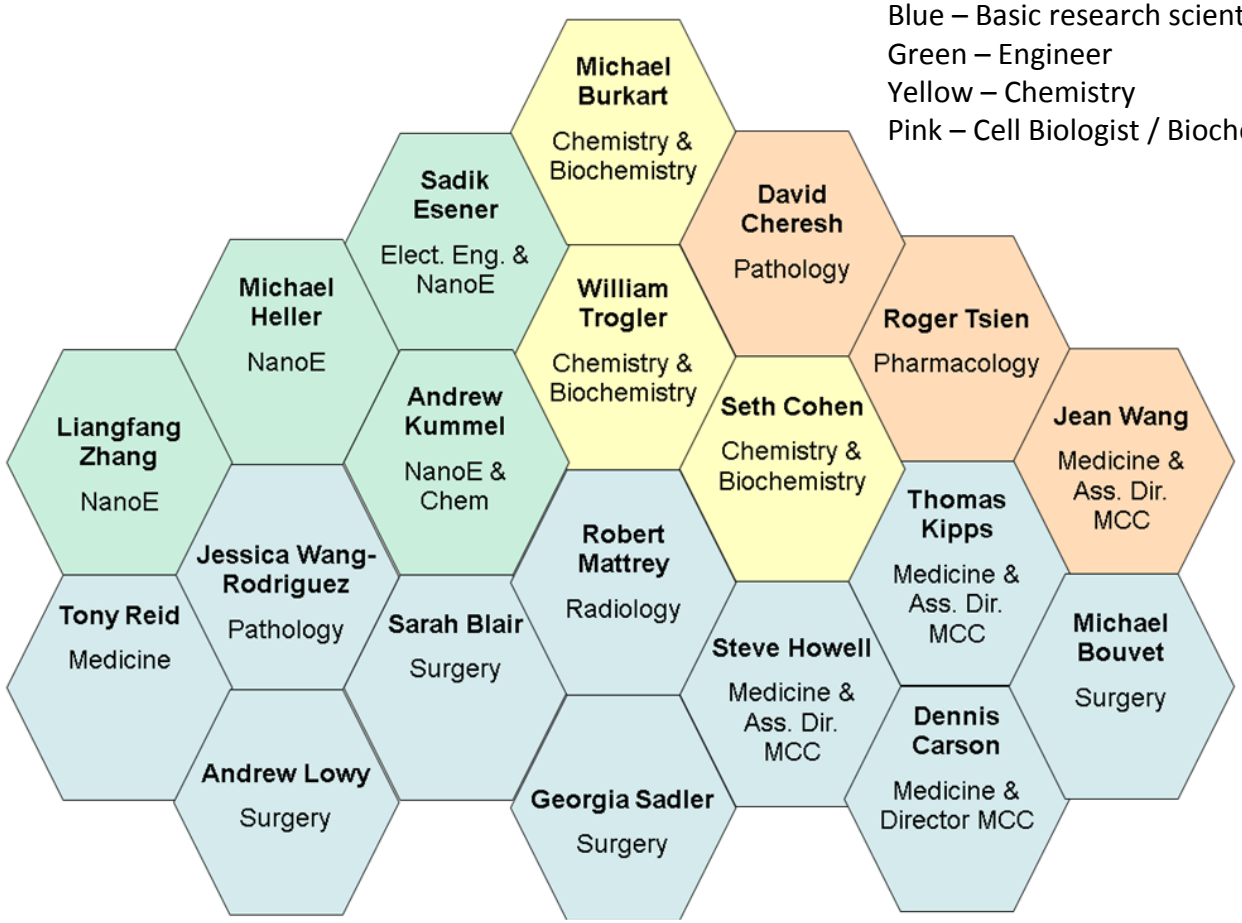
Training in the responsible conduct of research (RCR) will be provided through both the mentored research and didactic components of the CRIN program. A central premise is that trainees need to gain a full appreciation of the ethical and social responsibilities of research. To this end all trainees will be required to successfully complete one of the Research Ethics Program courses. This will usually be "Ethics and Survival Skills in Academic", "Scientific Ethics", "Scientific Integrity", or "Ethics in Scientific Research". These courses are intended to satisfy the NIH requirement for instruction in the responsible conduct of research. They emphasize the intersection between the practical aspects of science (e.g. roles and responsibilities, writing grants and papers, and finding a job) and ethical decision-making. Topics include roles and responsibilities of researchers, data collection and ownership, issues relating to use of animal and human subjects, scientific and grant writing, code of ethics for authors, reviewers and editors, conflicts of interest. The specific course will be a joint decision of the mentor and trainee and will be included in the training plan.

The Center for Cross Training Translation Cancer Researchers in Nanotechnology (CRIN) - OVERVIEW

Robert Mattrey – PI

Andrew Kummel –coPI

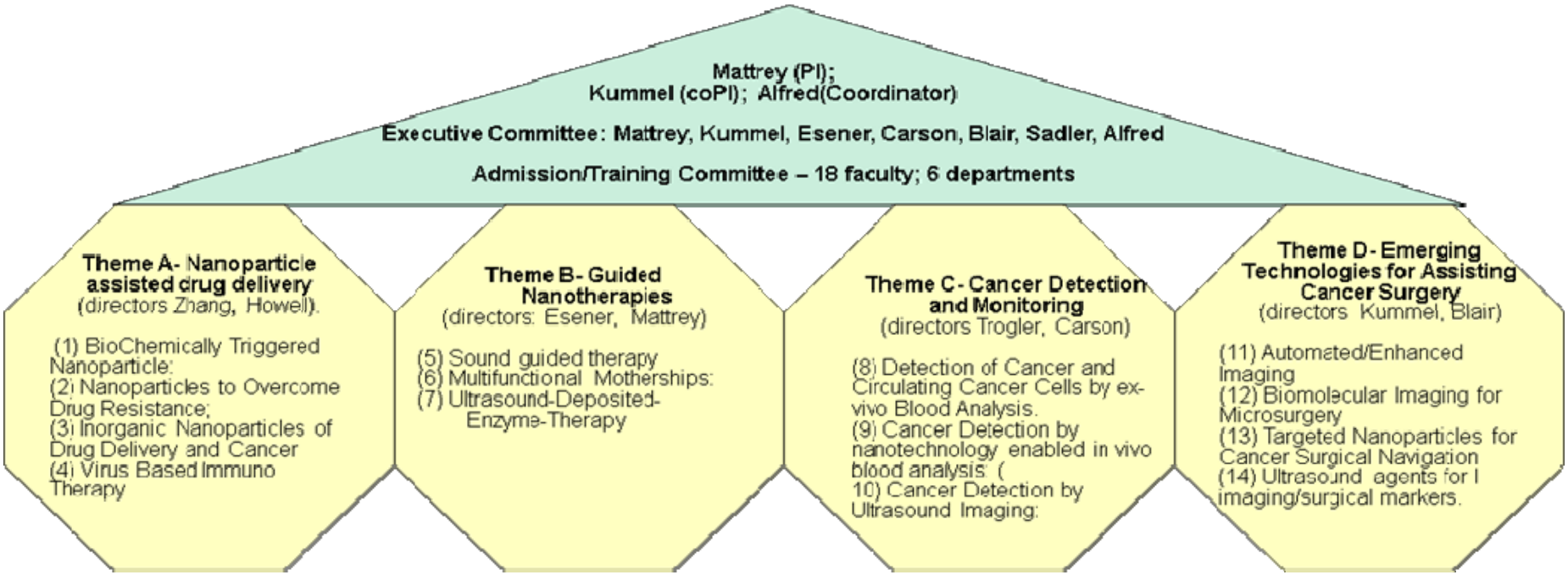
Larry Alfred - Director



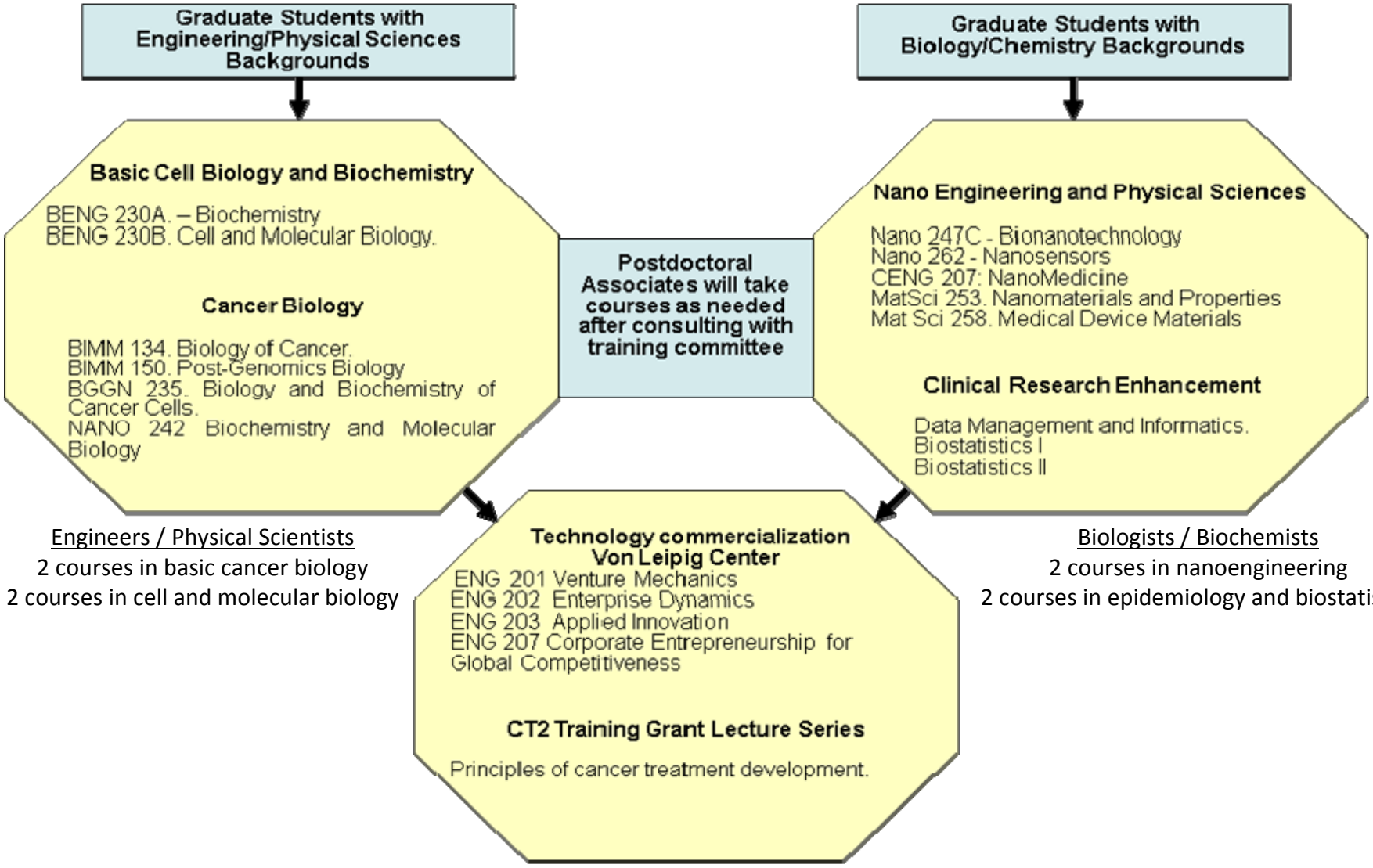
Each student has two mentors: basic research and clinical research.

Each faculty mentor (a) is a participating member of the Cancer Center, (b) has peer reviewed cancer or cancer-related research funding, (c) is conducting translational research, (d) is interested in emerging technologies in cancer diagnosis and/or therapy.

Research Hybridizing Translation Cancer Research and Nanotechnology



Outline of Courses – 2 Tracks of Re-Education



Engineers / Physical Scientists
2 courses in basic cancer biology
2 courses in cell and molecular biology

Biologists / Biochemists
2 courses in nanoengineering
2 courses in epidemiology and biostatistics

All
1 course in technology commercialization
lecture series in cancer treatment development

Coursework in technology commercialization – UCSD Von Liebig center

Pre-seed FundingGap funding (up to $75K) to projects via a competitive process. 19 startup companies that have leveraged more than $80M in capital and created over 150 jobs

ENG 201 – *Venture Mechanics*: Provides a deep understanding of the core processes of innovation and new product/market development

ENG 202 – *Enterprise Dynamics*: teaches how to design, build, manage and grow innovative companies: It focuses on the CTO/VP level of an organization, which is the middle stage of an engineer's career. There is a strong emphasis on direct exposure to real firms via a major project and through an interactive computer simulation based business competition.

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ENG 207 – *Corporate Entrepreneurship for Global Competitiveness:* uses the medical device industry as an example to explore corporate entrepreneurship and the innovation process.

UCSD Jacobs VON LIEBIG CENTER

InflammaGen
Saving Life Through Science

RHEVISION TECHNOLOGY, INC.

InhibeX

CANCER THERAPEUTICS T32 LECTURE SERIES

9/24/10	Mark Stevenson Lifetech Tech	Genomic Medicine Using Biological Insights to Enable the Right Therapy the First Time
9/28/10	Stephen B. Howell, MD UCSD Hem/Onc	Cancer Therapeutics Development
10/1/10	John Ryals, PhD Metabolon	Non-Targeted Metabolomic Analysis in Cancer Treatment and Biomarker Discovery
10/12/10	Tony Reid, MD, PhD UCSD Hem/Onc	Targeting Transcription
10/19/10	Marianne Manchester, PhD UCSD Pharmacy	Viral Nanoparticles as Scaffolds for Targeted Therapeutics and Vaccines
10/26/10	Lyudmila Bazhenova, MD UCSD Medicine	Learning from Lung Cancer: Benefits of Adding a Clinician to Your Team
11/2/10	Michael Karin, PhD UCSD Pharmacology	Cytokines in tumor development, progression, metastasis and therapy
11/9/10	Catriona Jamieson, PhD, MD UCSD Hem/Onc	The Molecular Evolution of Leukemia Stem Cells
11/15/10	Norman Greenberg, PhD Pfizer	The Right Medicine for the Right Patient: A New Path for Drug Discovery
11/16/10	Steve Dowdy, PhD UCSD Cell & Mol Med	RNAi Therapeutics: The Ultimate Personalized Cancer Treatment?
11/23/10	Philip Bourne, PhD UCSD Pharmacology	Polypharmacology: The Good News and Bad News of Possible Cancer Therapy
11/30/10	Dennis Carson, MD UCSD Cancer Center	
	John Hood, PhD Wintherix, LLC	Wnt and Other Stem Cell Pathways as Cancer Drug Targets
12/6/10	Tom Bumol, PhD Lilly	TBA
12/7/10	Michael Gilson, PhD Pharmacy	Computer-Aided Drug Design: Concepts, Methods and Applications
12/14/10	Kelly Frazer, PhD UCSD Pediatrics	An integrated genomic analysis of a Non small cell lung carcinoma
12/21/10	Barbara Parker, MD Hem/Onc	Opportunities and Challenges in Breast Cancer Clinical Research
1/18/11	Andrew Allen, PhD Clovis	Cancer Drugs and Companion Diagnostics: Tales from the Trenches?
Jan 2011	Kang Zhang, MD UCSD Ophthalmology	Genetics and Stem Cell Based Therapy for Age Related Macular Degeneration

UCSD-KACST Center of Excellence in Nanomedicine presents

Frontiers in Therapeutic and Diagnostic Delivery

Dennis Bong, Ph.D. — October 13, 2010
Ohio State University
"Molecular recognition at the lipid-water interface"

Debra Auguste, Ph.D. — November 17, 2010
Harvard University
"Leukocyte Analogues"

Yue Zhao, Ph.D. — December 1, 2010
Université de Sherbrooke
"Photocontrollable Block Copolymer Micelles, Vesicles, Nanogels and Microgels"

Glen Kwon, Ph.D. — *January 19, 2011 *PSB Ed Center 3
University of Wisconsin-Madison
"Polymeric Micelles for Multiple Drug Delivery"

Mattias Nahendorf, Ph.D. — January 26, 2011
Harvard University
"Nanoparticles for Molecular Imaging"

Joseph DeSimone, Ph.D. — *February 3, 2011 *Thursday
University of North Carolina at Chapel Hill
"Co-opting Moore's Law: Vaccines and Therapeutics on a Wafer"

Tejal Desai, Ph.D. — February 9, 2011
University of California San Francisco
"Nanostructured Devices for Therapeutic Delivery"

Jennifer Lippincott-Schwartz, Ph.D. — February 16, 2011
National Institutes of Health
"Breakthroughs in imaging using photoactivatable fluorescent protein technology"

Erkki Ruoslahti, Ph.D. — February 23, 2011
University of California, Santa Barbara
"Vascular Zip Codes in Targeted Delivery of Multifunctional Nanodevices"

Alexander Kabanov, Ph.D. — March 2, 2011
University of Nebraska Medical Center
"Polymer Micelles from Bench to the Bedside"

Trevor Douglas, Ph.D. — March 9, 2011
Montana State University
"Protein Cage Architectures as Templates for Hard and Soft Materials in Medicine"

Andrea Kasko, Ph.D. — March 16, 2011
University of California Los Angeles
"Photodegradable Polymers for Biomedicine"

Sean Whelan, Ph.D. — March 23, 2011
Harvard Medical School
"Biting the Bullet: a Visual Tour of Vesicular Stomatitis Virus Cell Entry"

Heather Maynard, Ph.D. — April 6, 2011
University of California, Los Angeles
"Protein-polymer conjugates for wound healing and cancer drug delivery."

Steven Schwendeman, Ph.D. — April 20, 2011
University of Michigan
"New injectable polymer depots for controlled release of peptides and proteins"

Thomas Meade, Ph.D. — April 27, 2011
Northwestern University
"Molecular Imaging"

Francis Szoka, Ph.D. — May 11, 2011
University of California San Francisco
"New Polymer and Lipid Materials for Drug and Nucleic Acid Delivery"

Jennifer Elisseeff, Ph.D. — May 25, 2011
Johns Hopkins University
"Translational Tissue Engineering"

Justin Hanes, Ph.D. — June 29, 2011
Johns Hopkins University
"Nanomedicine for Mucosal Tissues"

Student and Program Evaluations

Graduate Students Evaluation by Faculty

Year 1 Year 2 Year 3 Year 4 Year 5

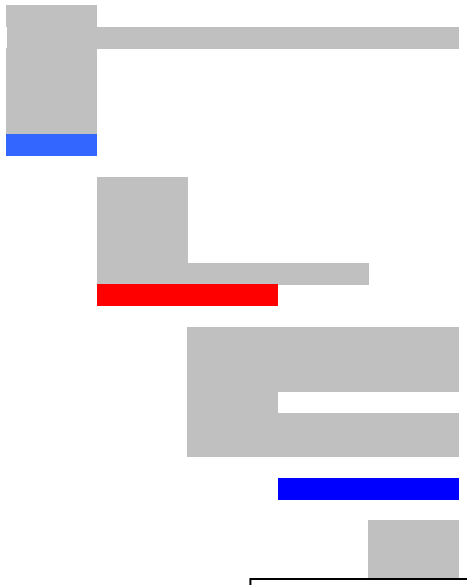
Develop training plan
Present at journal club 12 times
Present at group meeting 12 times
Complete lab rotations an choose research lab
Complete 80% of course work
Write F31 fellowship proposal
Received support from home department

Develop thesis outline
Present at group meeting twice per month
Present a poster at a local conference
Complete 100% of course work
Write F31 fellowship proposal
Receive Support from R25T

Co-author a paper
Present at group meeting every week
Present two posters at a local or national conferences
Prethesis Exam - final revision of thesis plan
Assist in writing a grant proposal
Write a paper as primary author

Receive Support from fellowship or research grant

Defend Thesis
Apply for postdoctoral fellowships
Apply for postdoctoral positions



Postdoc Evaluation by Faculty

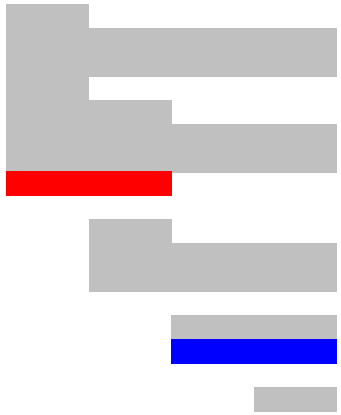
Year 1 Year 2 Year 3 Year 4

Develop training plan
Present at journal club 12 times
Present at group meeting each week
Complete 80% of course work
Present a poster at a local conference
write fellowship proposals
Co-author a paper
Receive support from R25T

Complete 100% of course work
Assist in writing a grant proposal
Write a paper as primary author

Present two posters at a local or national conferences
Receive support from fellowship or research grant

Write proposal and apply for faculty positions



Evaluation of Trainee By Faculty

Program Evalation by Grad Students

Year 1 Year 2 Year 3 Year 4 Year 5

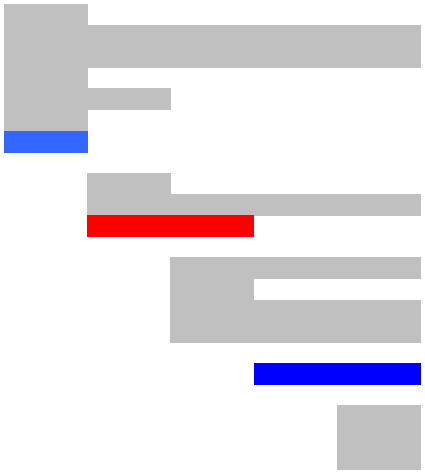
Develop training plan
Knowledge gained at journal club
Feedback at group meeting
Ability to work in top choice research lab
Quality of course work
Assistance with F31 proposal
financial support from home department

Assistance in developing thesis outline
Identifying relevant conference for poster presentations
Financial Support from R25T

Assistance in co-authoring a paper
Assistance in developing a thesis plan
Instruction in grant writing
Advising in writing 1st author paper

Receive Support from fellowship or research grant

Assistance is writing thesis
Assistance in writing postdoctoral fellowship proposals
Assistance in identifying postdoctoral fellowships positions



Program Evaluation by Postdocs

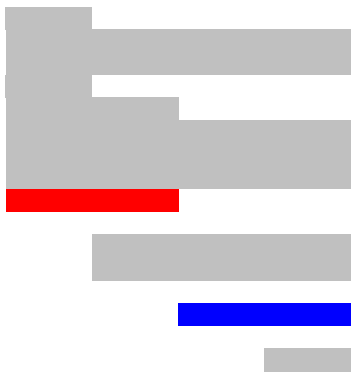
Year 1 Year 2 Year 3 Year 4

Develop training plan
Knowledge gained at journal club
Feedback at group meeting
Ability to work in top choice research lab
Quality of course work
Identifying relevant conference for poster presentations
Assistance fellowship proposals
Assistance in co-authoring a paper
Financial support from R25T

Assistance in writing a grant proposal
Askance in writing 1st author paper

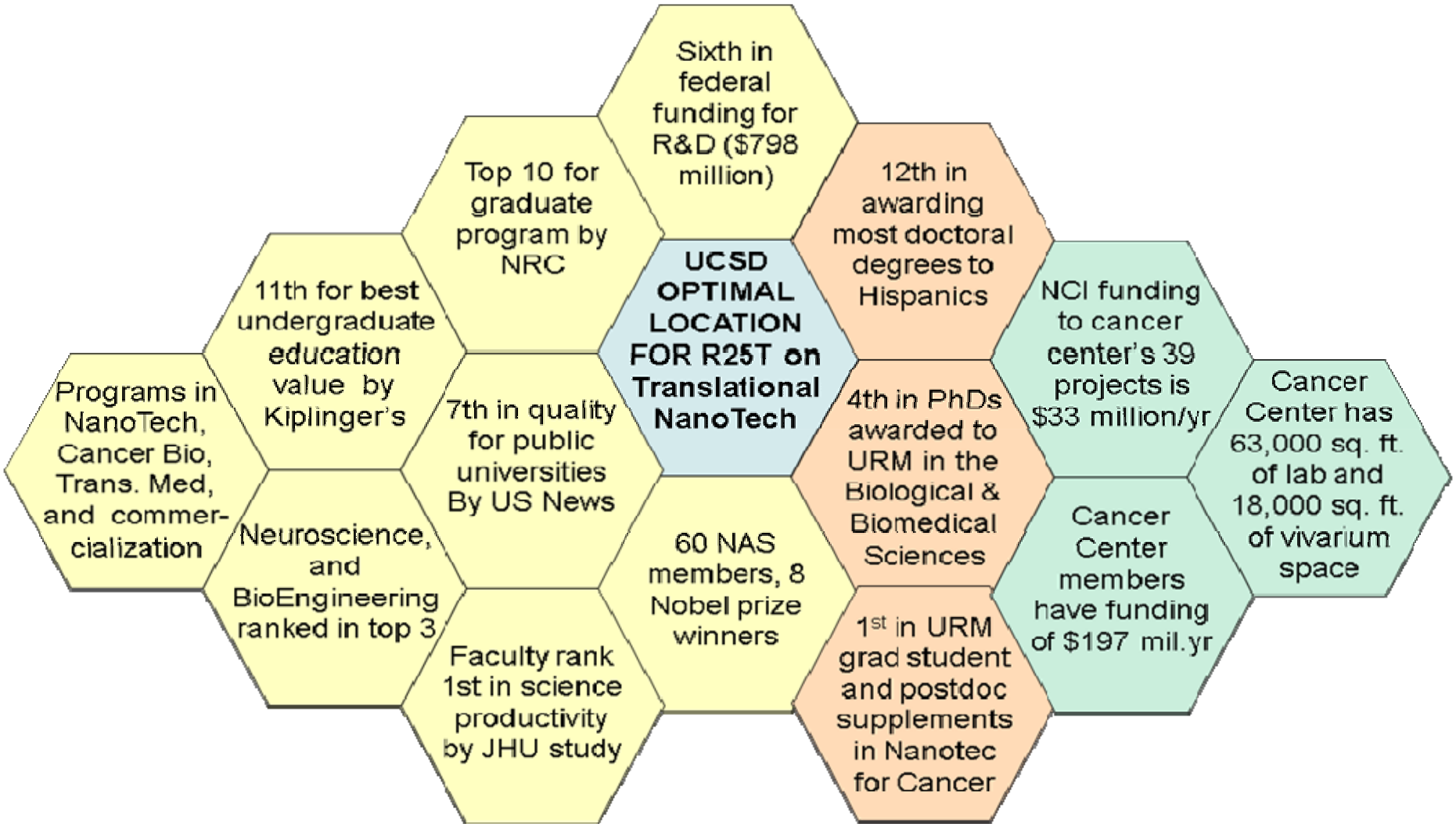
Financial support from fellowship or research grant

Assistance in developing porposals for faculty positions



Evaluation of the Program by the Trainees.

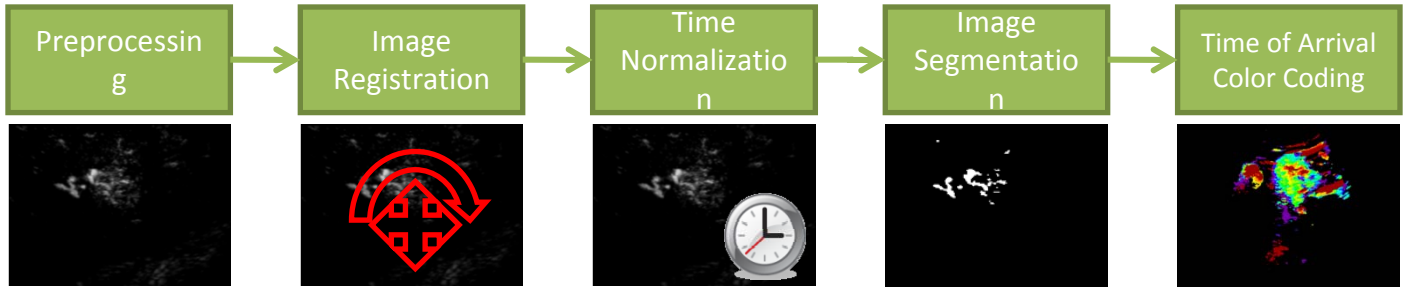
UCSD Research Reputation

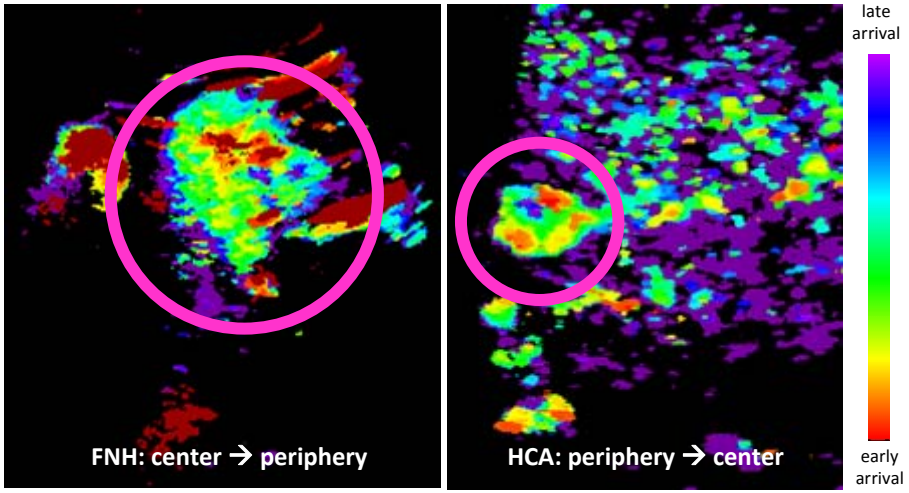


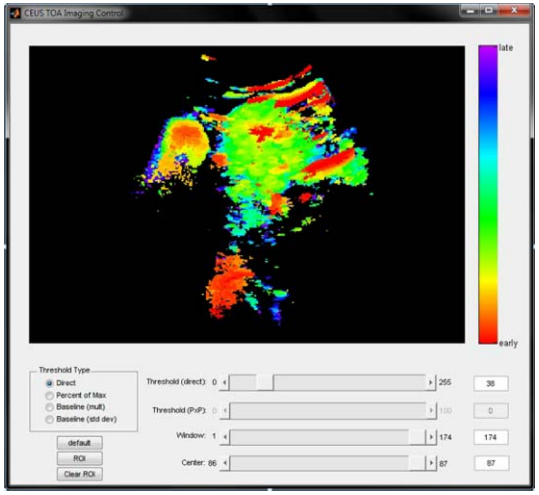
Yellow – Science
Pink – Diversity
Green – Cancer Research

Compressing the Time Element of Contrast Enhanced Ultrasound into a Single Image for Tumor Diagnosis

Casey Ta, Andrew Kummel, Christoph Dietrich, Yuko Kono, Robert Mattrey



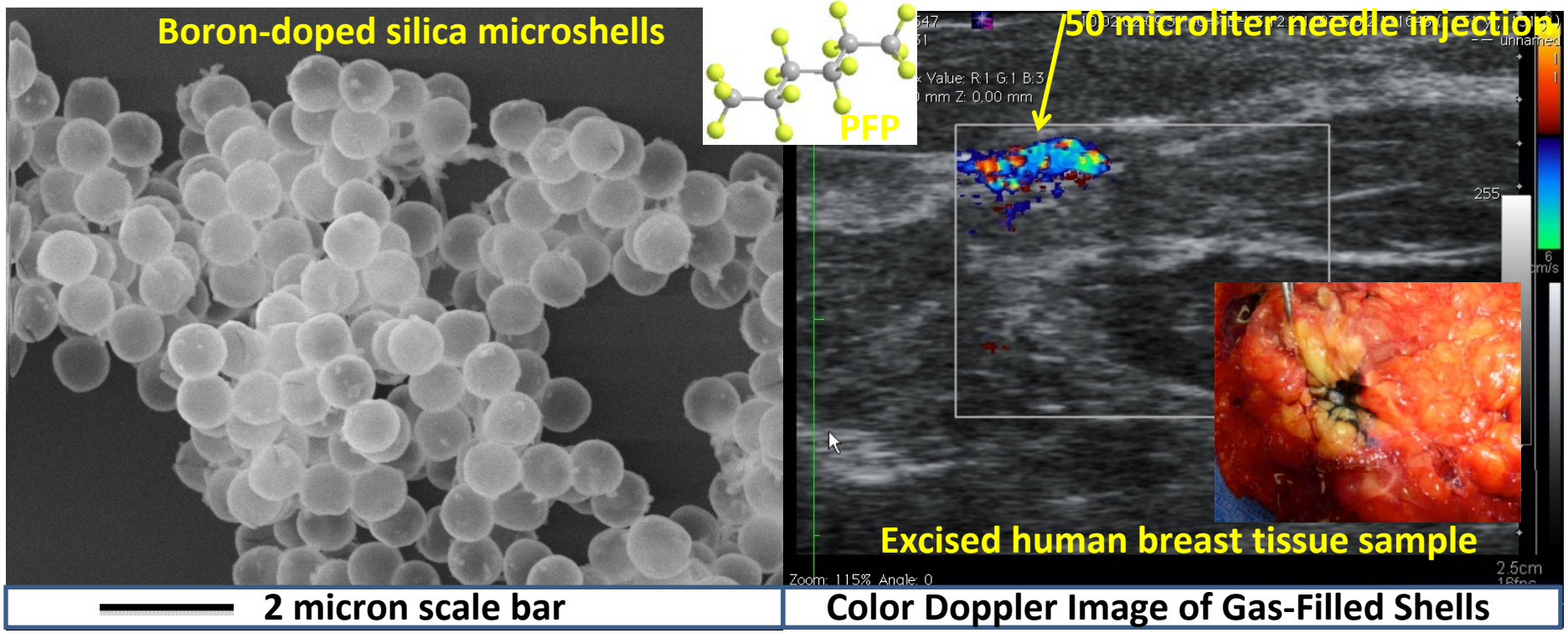




- Two types of liver lesions – focal nodular hyperplasia (FNH) and hepatocellular adenoma (HCA) – can be distinguished by their characteristic perfusion patterns in contrast enhanced ultrasound (CEUS), but it requires an expert radiologist for accurate diagnoses.
- Software has been developed by a CRIN student to analyze CEUS videos and encode the perfusion information into a single color image.
- Application designed for use by radiologists with any level of experience and is being tested for accuracy, inter- and intraobserver reliability.
- CEUS videos were collected for analysis from UCSD (Dr. Kono) and Caritas Hospital Bad Mergentheim in Uhlandstr, Germany (Dr. Dietrich).

CEU of Silica Microshells: Contrast Agent for Marking Tumors for Surgical Removal

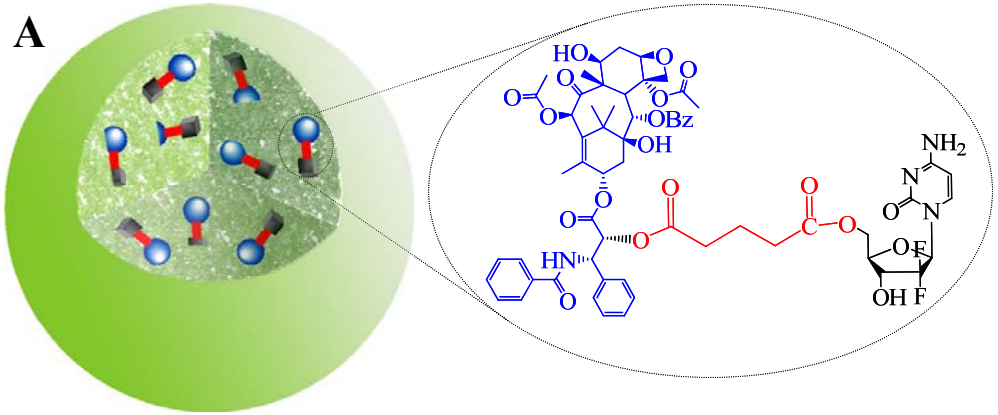
H. Paul Martinez, Yuko Kono, Sarah L. Blair, Sergio Sandoval, Jessica Wang-Rodriguez, Robert F. Mattrey, Andrew C. Kummel, William C. Trogler

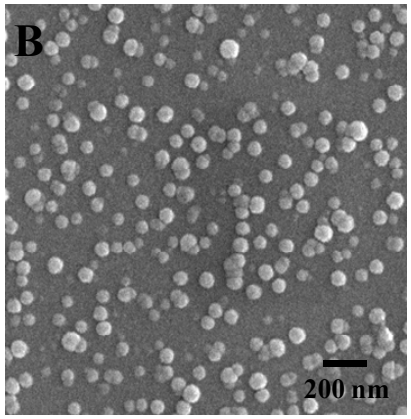


- Ultrasound imaging of nonpalpable tumors for surgical excision could decrease the need for repeat surgery due to incomplete tumor removal.
- Current methods that use inserted wires are painful and lack 3D localization.
- Current ultrasound imaging agents that use soft shell micro-bubbles are short-lived and cannot be imaged hours and/or days later, but our gas-filled silica shells can.
- The localization has been validated in tissue samples and in live rabbit animal models.
- Nanoshells allow imaging of small particles which can be transported to lymph nodes!!!
- Martinez, Sandoval – ET CURE graduate students.

Nanoparticle Assisted Dual Drug Delivery

Santosh Aryal, Che-Ming Hu, Sadik Esener, Steve Howell, Liangfang Zhang





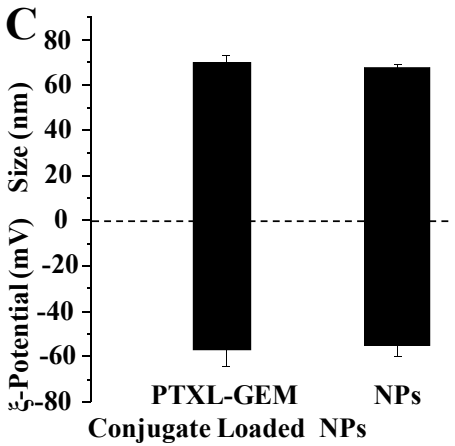
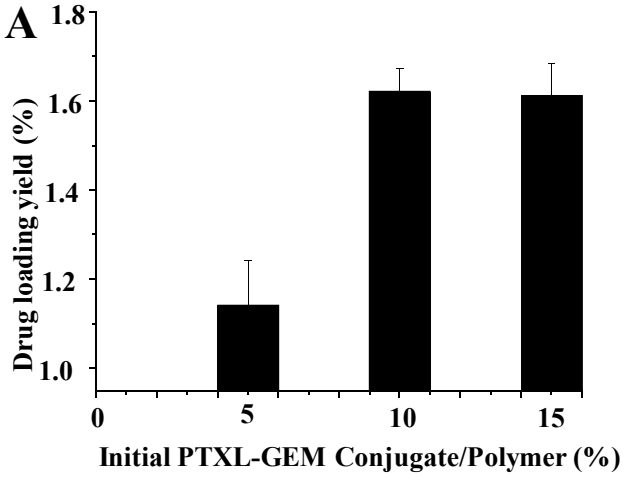


Figure 1. (A) Schematic illustration of a PTXL-GEM conjugates loaded nanoparticle. **(B)** Representative SEM image of PTXL-GEM conjugates loaded nanoparticles. **(C)** Diameter and surface zeta-potential of PTXL-GEM conjugates loaded nanoparticles and empty nanoparticles measured by dynamic light scattering (DLS).



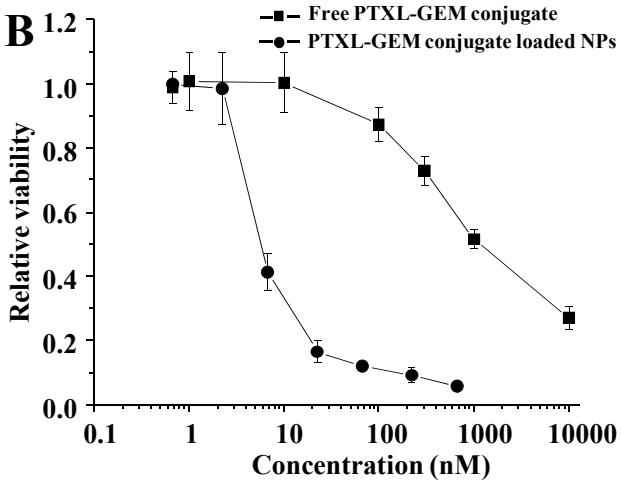
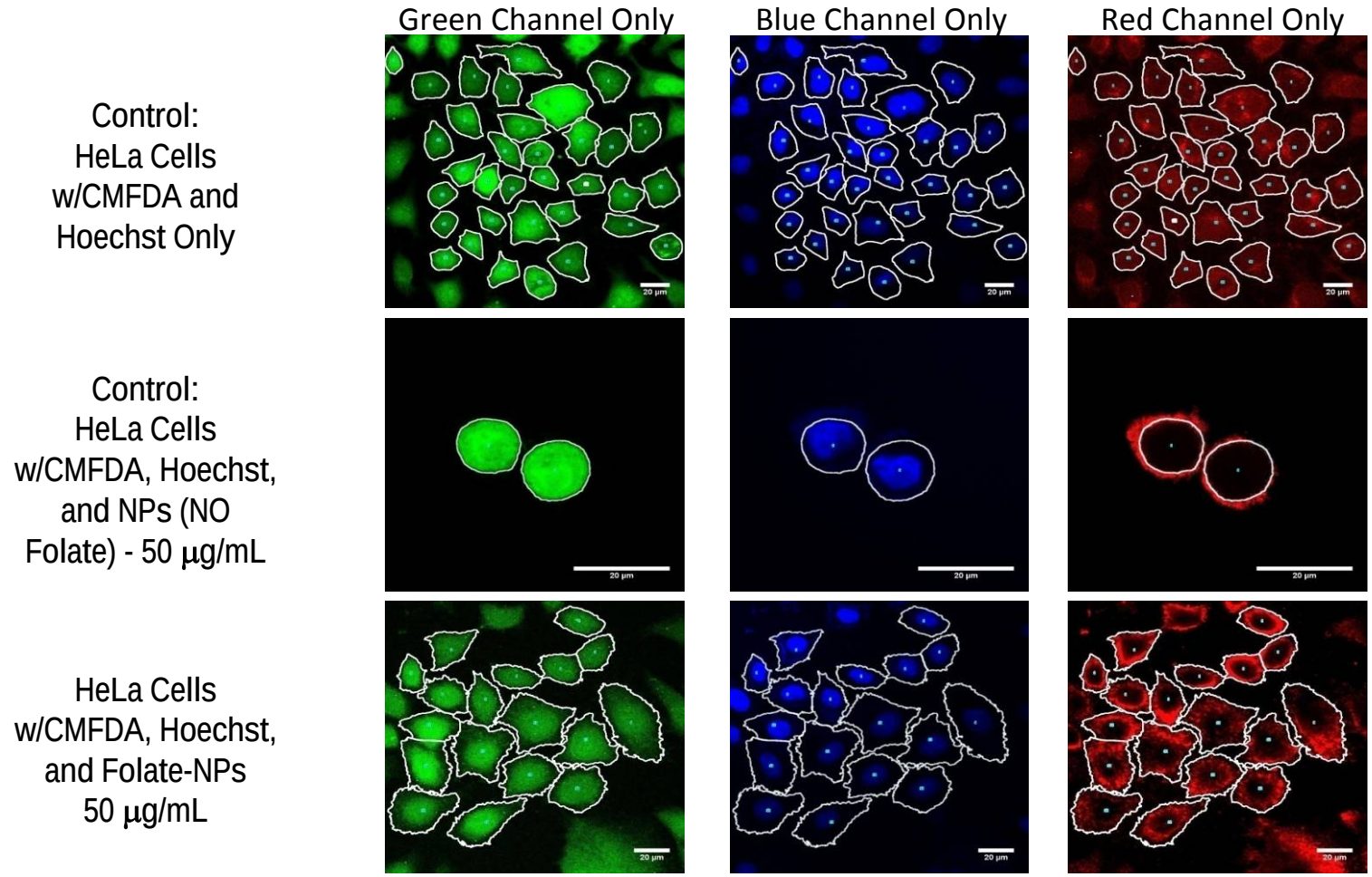


Figure 2. (A) PTXL-GEM conjugates loading yield. **(B)** Cellular cytotoxicity of PTXL-GEM conjugates loaded nanoparticles and free PTXL-GEM conjugates against XPA3 human pancreatic cancer cell line.

PLGA-Lipid Hybrid NPs: With & Without Folate Results

Sergio Sandoval, Alex Liberman, Jian Yang, Sharraya Aschemeyer, Jesus G. Alfaro, Liangfang Zhang, Steve Howell, Andrew C. Kummel, William C. Trogler

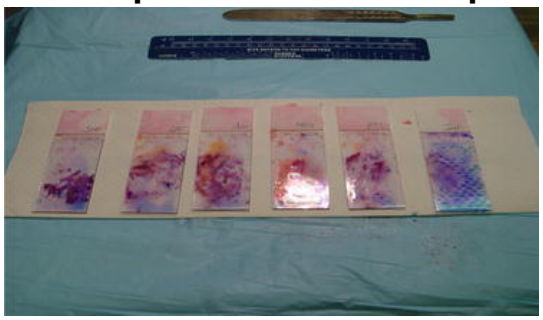


- Careful studies of effect of targeting on nanoparticle-cell adhesion vs nanoparticle-cell endocytosis
- Majority of Folate targeted NPs tend to be endocytosed within HeLa Cells. Timing with drug release from nanoparticle is critical
- Sandoval – ET CURE student winner Siebel Award Prize; Liberman, Aschemeyer, Alfaro- former ET CURE undergrad and 2 now in graduate school

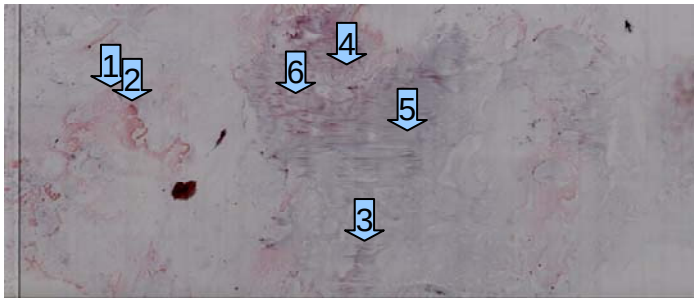
Automated Analysis of Touch Prep for Breast Cancer Surgery

M.E. Ruidiaz, M.J. Cortes-Mateos, S. Sandoval, J. Wang-Rodriguez, A. Kummel, S. Blair

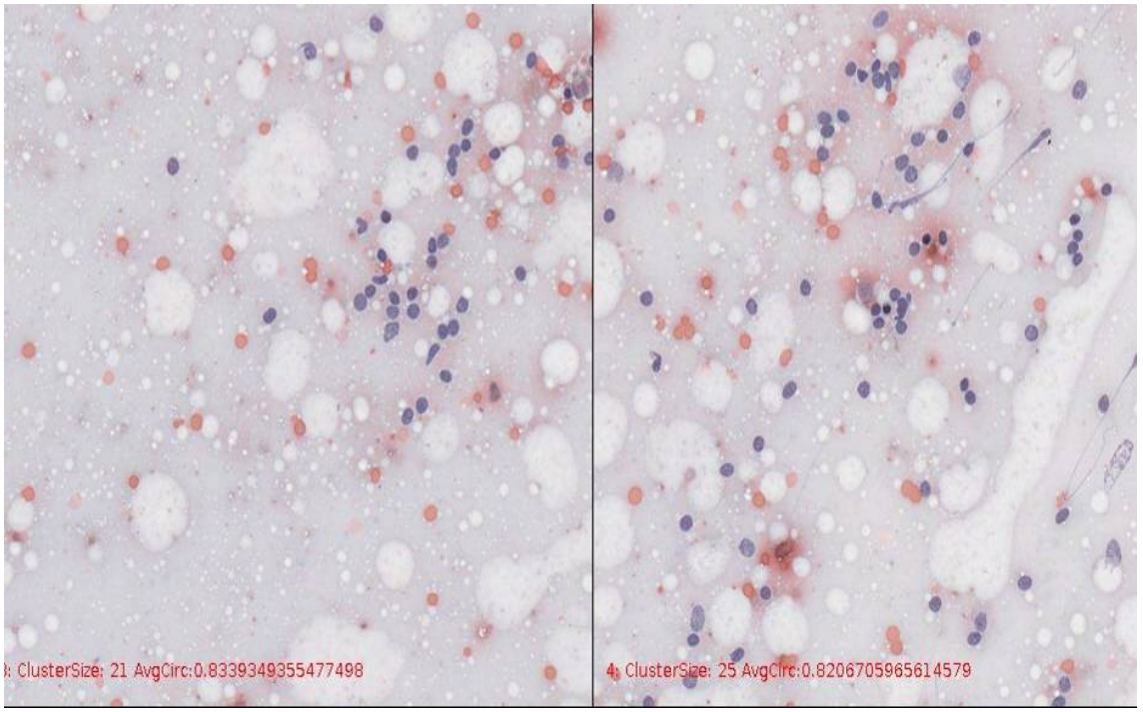
1. Intraoperative Touch Preparation



2. Cancer Cluster Identification



3 Cancer Cluster Presentation for Clinician



20-40% of breast cancer surgeries require a second operation due to positive margin. Automated analysis was develop so that touch prep could be employed without a skilled cytopatholgist..

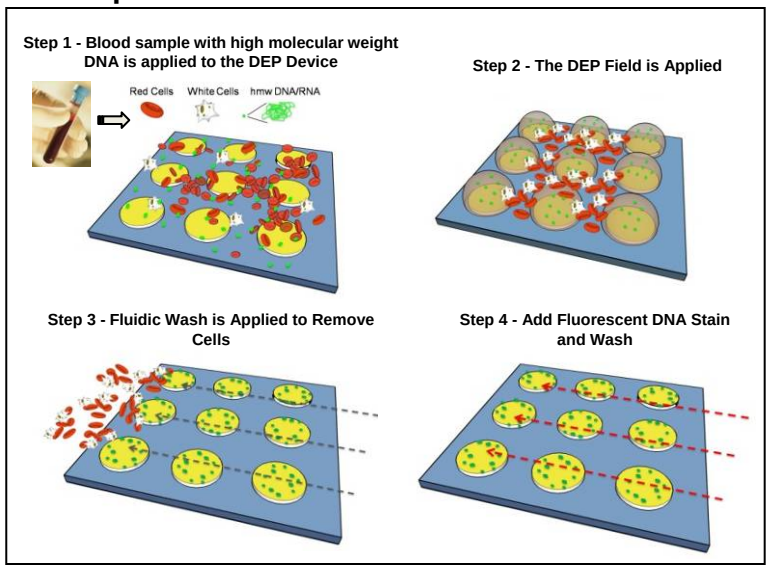
H&E stained touch preps known to be positive or close by permanent section analysis were automatically outlined and manually processed to identify lymphocytes, junk/debris and cancer cells followed by machine learning classifier training with cellular and local environment descriptors.

Testing was performed on an 8 case dataset (46 touch preps) unknown to the classifier. Positive margin status and thus secondary surgeries may have been avoided 50% of the time by allowing intraoperative reexcission.

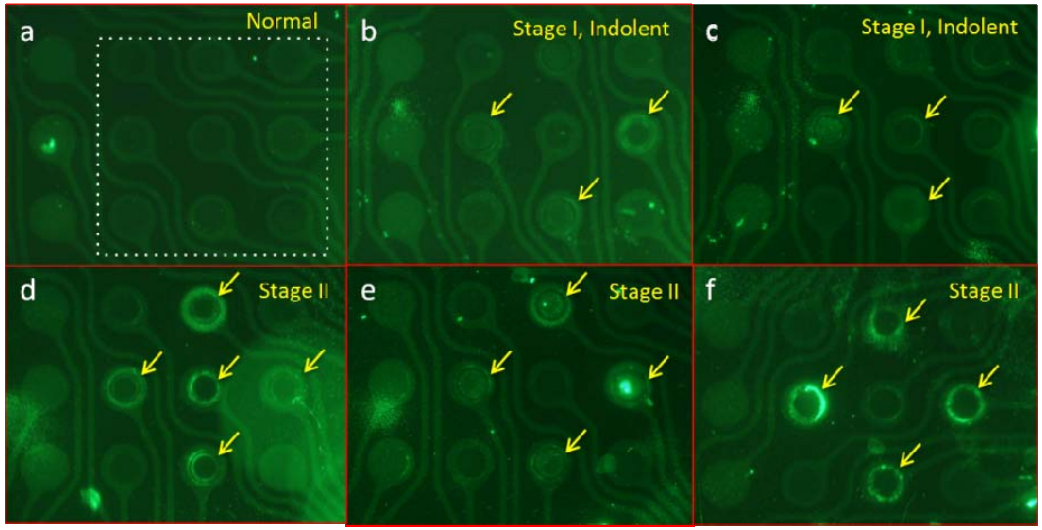
Detection of cfc-DNA Biomarkers in CLL Whole Blood

Michael J. Heller, Thomas Kipps, Avery Sonnenberg, **Raj Krishnan** and Laura Rassenti

DEP for Cancer Cell, DNA BioMarkers and Nanoparticle Isolation in Whole Blood



Isolation of cfc-DNA in CLL Patient Whole Blood



- ID and verify nature of cfc-DNA/RNA from CLL and other blood samples
- cfc-DNA /RNA isolation from pancreatic ovarian cancer patient blood samples
- ID other cellular nanoparticulates (nuclei, mitochondria, endoplasmic reticulum, lysosomes, *vesicles,* etc.)
- In-situ RT-PCR and fluorescent antibody (seamless sample to answer)
- Other Application: MI and cardiac disease, stem cell separation and isolation work, Infectious disease (bacteria/virus) applications

Personalized Wireless Physiological Monitoring of Brain Tumor Patients

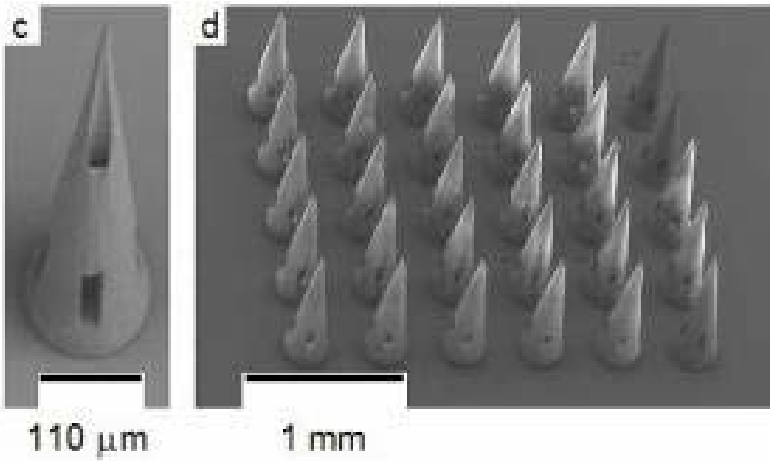
Santosh Kesari, M.D., Ph.D. , Dennis Carson MD, Joe Wang PhD (Sensors), Manny Ruidiaz (Sensor Array Software)

Physiological Parameters to be Monitored in Brain Tumor Patients (and Neurosurgery patients in general) via a Sensor Array

- EKG monitoring, pulse oximetry, plasma chemistry (kidney, liver function), temperature, pulse rate, blood glucose, markers of inflammation.

Importance of Continuous Monitoring

- Acquire early indications of infections or untoward effects of surgery or radio/chemotherapy.
- Facilitate early intervention to prevent potentially serious complications (infections/bleeding diathesis on new drugs-angiogenesis inhibitors).
- Real-time monitoring at home; patients have greater sense of security.



•The research program aims at enhanced electrochemical biosensors for discharge patient monitoring

•(left) Wang group helped develop wearable non-invasive GlucoWatch – clinically validated, commercially available

•(right) Microneedle array sample blood glucose levels by measuring the glucose concentration in the interstitial fluid

Local TV News for Public Outreach

Use clinical faculty to talk

Have lots of students on camera

The TV crew does all the work and we get the video for our web site

Example[clip1.m4v]

http://www.10news.com/news/25700294/detail.html