

EFRI



MANDATE AND VISION OF EFRI

MANDATE - EFRI will serve a critical role in helping the Directorate for Engineering (ENG) focus on important emerging areas in a timely manner. EFRI will annually recommend, prioritize, fund, and monitor initiatives at the emerging frontier areas of engineering research and education.

VISION – All NSF ENG Programs support research at the frontiers of research and innovation.

EFRI Office provides opportunities in interdisciplinary areas at the *emerging* frontiers of research and innovation that (a) are transformative, (b) address national needs/grand challenges, and (c) will make ENG unrivaled in its global leadership.

WHAT DO YOU THINK?

Click on the engineering challenge you think is the most important:

NAE GRAND CHALLENGES

RESTOR



Make solar energy economical



Provide energy from fusion



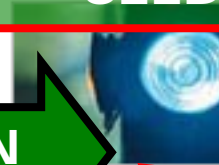
Develop carbon sequestration methods



Manage the nitrogen cycle



Provide access to clean water



Restore and improve urban infrastructure



Advance health informatics



Engineer better medicines



Reverse-engineer the brain



Prevent terrorism



Secure cyberspace



Enhance virtual reality



Advance personalized learning



Engineer the tools of scientific discovery

**A
R
E
S**

CBE

BioFlex

BSBA

RESIN

SEED

M3C

COPN

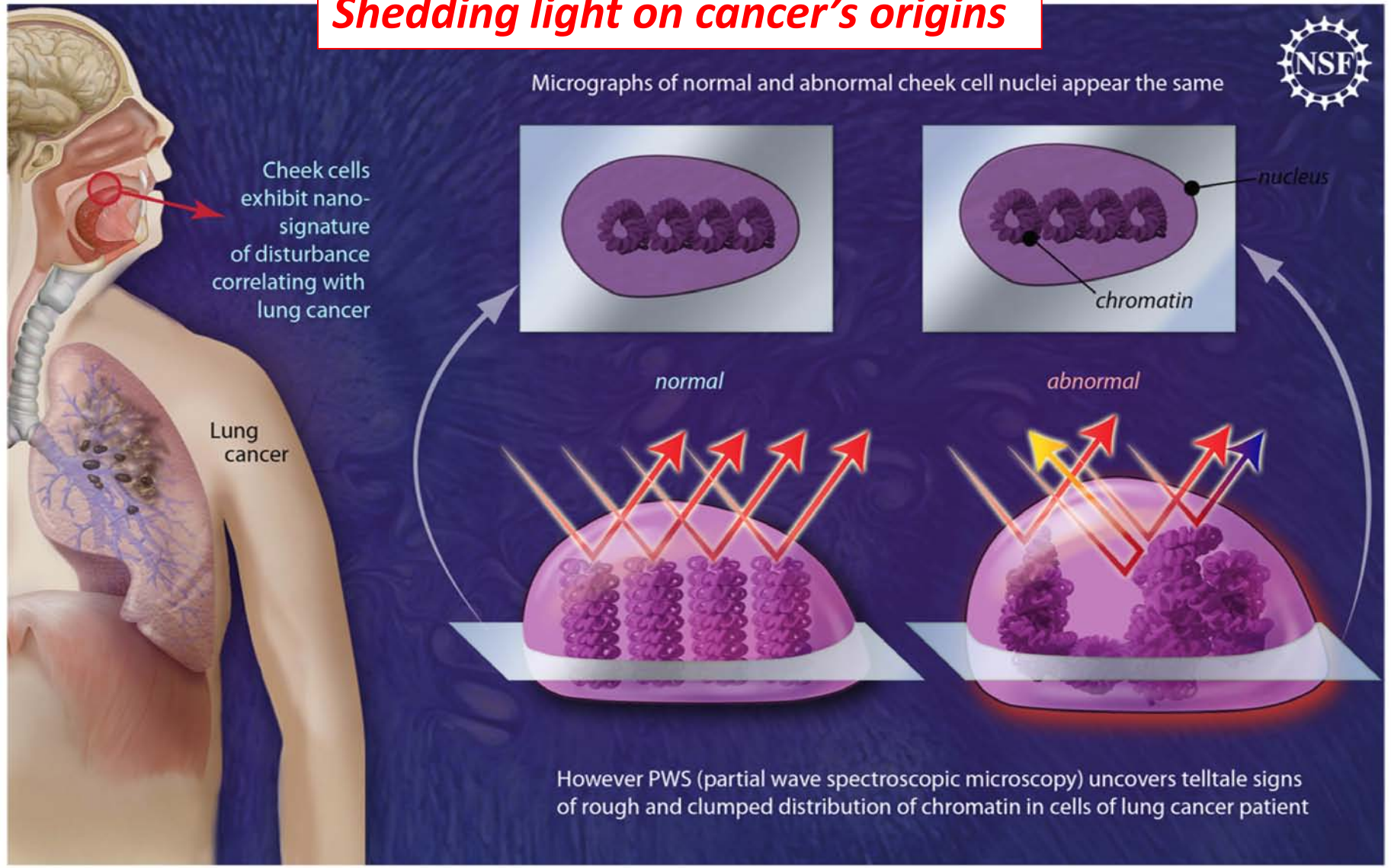
HyBi

MIKS

ODISSEI

PSBR

Shedding light on cancer's origins



[V. Backman, Northwestern University, [0937987](#)] Nanoscale disturbances in cheek cells indicate the presence of lung cancer. Regular microscopy looking at chromatin, the genetic material inside a cell's nucleus, will not reveal significant dissimilarities between the cheek cells of a healthy person and those of a lung cancer patient. A new technique called partial wave spectroscopic microscopy (PWS) zeroes in on nano-level disturbances, which are harbingers of trouble. *Credit: Zina Deretsky, NSF.*

Sustaining EFRI Topics

Status Check

- CBE (7 projects, FY 2007)

✓ – **STC AWARD TO EFRI PI (Roger Kamm): Emergent Behaviors of Integrated Cellular Systems**

- Others will try for ERC or other Center programs
- NIH

- ARES (5 projects, FY 2007)

- ECCS and CMMI support the technical area but group awards?

✓ – **National Robotics Initiative and Cyber-physical Systems**

- COPN (4 projects, FY 2008)

✓ – **ERC at U. Washington led by a COPN co-PI, Yoky Matsuoka: ERC for Sensorimotor Neural Engineering**

- RESIN (8 projects, FY 2008)

✓ – **A RESEARCH CLUSTER IN CMMI**

- Group awards may be an issue

- BSBA (12 projects, FY 2009)

✓ – **NEW PROGRAM IN CBET: *Biosensing***

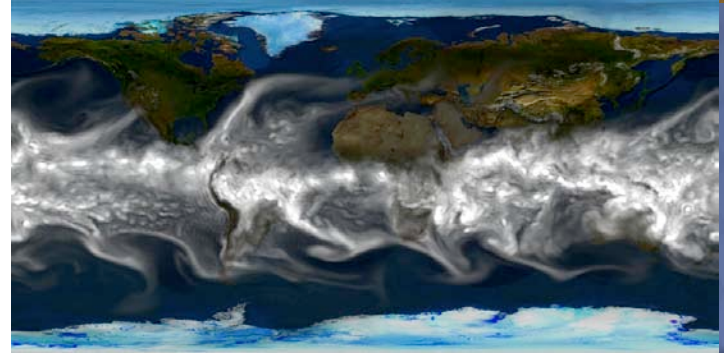
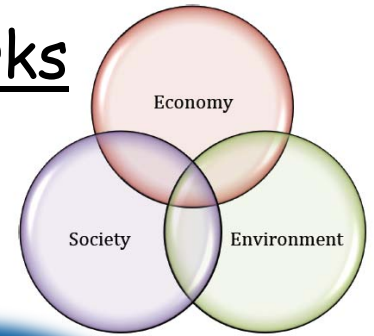
- Sensing programs in CMMI and ECCS

- HyBi (8 projects, FY 2009)

- CBET Sustainable Energy Program
- DOE

SEES GOALS & ENG INTERESTS

- Support Interdisciplinary Coordination Networks
 - Research Coordination Networks (RCNs)
- Support Interdisciplinary Research Networks
 - Sustainability Research Networks (SRNs)
- FY10 & FY12 Topic: Water
 - Water Sustainability and Climate (WSC)
- FY12 High Priority Topic: Energy
 - Sustainable Energy Pathways (SEP)
- Develop Interdisciplinary Workforce
 - SEES Fellowships
- Contribute to Global Sustainability
 - PIRE-SEES
- Enhance PI & Public Awareness
 - SEES Summit



Advanced Manufacturing

- Context
 - NSF Priorities
 - Advanced Manufacturing Partnership (AMP)
- NSF Role
 - Support through the core programs
 - Centers
 - Cross-cutting research initiatives
 - National Robotics Initiative
 - Materials Genome Initiative
 - National Nanotechnology Initiative
(e.g. Signature Initiative in NanoManufacturing)
 - Innovation Ecosystem
 - Education and human capital development
- Interagency Coordination and Partnerships



Director's NSF FY12 Budget Roll-out



**President Obama announces AMP
June 24, 2011 at Carnegie Mellon**



Cyber-Physical Systems (CPS) at NSF

- A **cyber-physical system** (CPS) is a system featuring a tight combination of, and coordination between, the system's computational and physical elements
- CPS Systems will find wide application in a wide diversity of areas. Examples include, but are not limited to:
 - > Healthcare
 - > Environmental sensing and monitoring
 - > Energy
 - > Manufacturing and process control
 - > Robotics
 - > Transportation
- CPS at NSF is a joint program with strong collaboration between the CISE and ENG Directorates
 - > CISE focuses upon the intelligent, computational, and networking aspects
 - > ENG/ECCS focuses upon the integration and hardware aspects
- Budget
 - > FY11: \$34M
 - > FY12: anticipate ~\$34M



Smart Infrastructure

Credit: MO Dept. of Transportation.



Autonomous Cars

Credit:
PaulStamatiou.co

The National Robotics Initiative

The next generation of robotic companions that work seamlessly with humans as co-workers, co-protectors, co-drivers, co-explorers, and co-inhabitants to enhance personal safety, health and productivity

- A nationally coordinated robotics technology R&D program across multiple government agencies
 - Multi-agency commitment: initially NSF, NASA, NIH, USDA
 - FY12 NSF Proposed Budget: \$30M CISE, \$9M ENG
- Serves multiple key national priorities: increased personal productivity in manufacturing, healthcare and security
- Strong coupling with industry and startups, through SBIRs
- Emphasizes common platforms & standard interfaces
- Will sponsor national competitions, outreach & education
- DCL published and 680 Letters of Intent received. Panels planned for February, 2012

