Advancing Fundamental Research Underlying Forensic Science

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National Commission on Forensic Science
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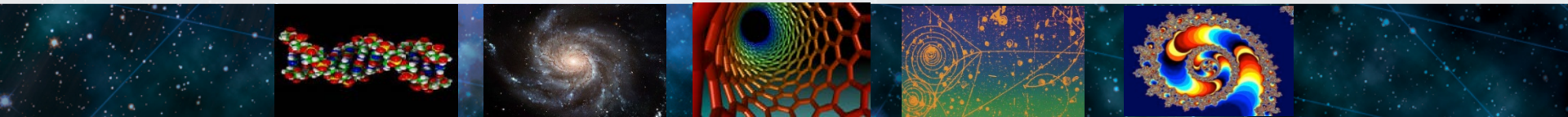
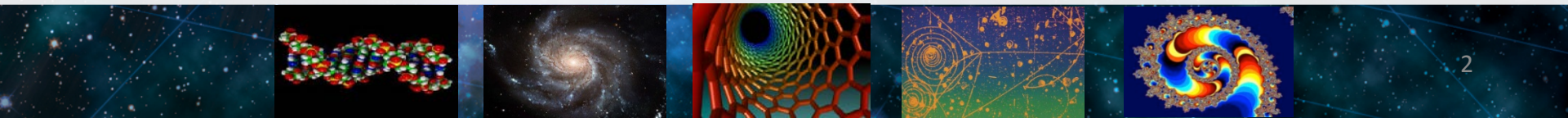


NSF's Mission

The National Science Foundation (NSF) is an independent federal agency created by Congress in 1950 "to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense…" With an annual budget of $7.5 billion (FY 2016), we are the funding source for approximately 24 percent of all federally supported basic research conducted by America's colleges and universities.

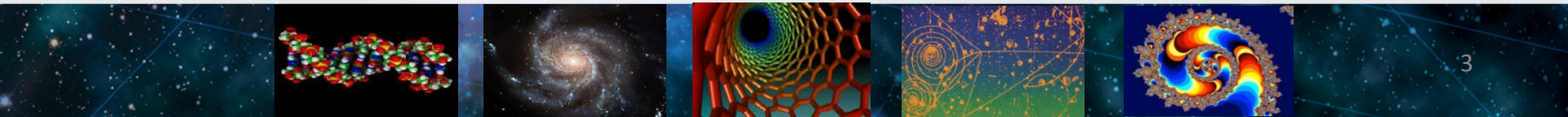
From NSF Strategic Plan 2014-18

- Invest in fundamental research to ensure significant continuing advances across science, engineering, and education.
- Strengthen the links between fundamental research and societal needs through investments and partnerships…with industry, other agencies, and international sponsors.

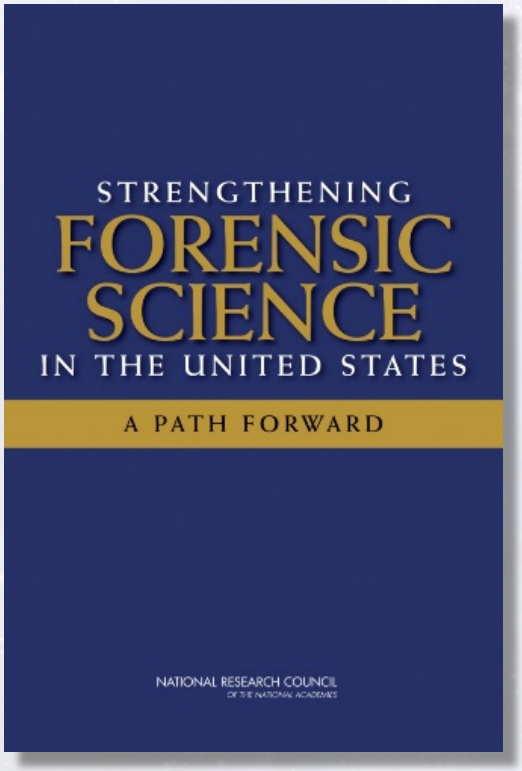


Peer-Reviewed Extramural Research

- >42,000 proposals per year, *unsolicited* and in response to various calls for proposals
- Review by independent subject matter experts for intellectual merit and broader impacts
- ~12,000 new awards per year, including research projects, workshops, equipment grants, center grants, and support for science education
- Awardees: >2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the U.S.



NSF's Increasing Visibility in Efforts to Strengthen Forensic Science

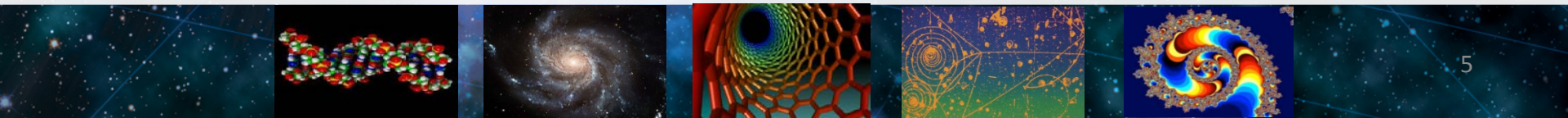


1. NSTC Subcommittee on Forensic Science (2009-12)
2. NSF Director testimony – Senate hearings (2012)
3. Proposed Senate Legislation (2013-14)
   Leahy and Rockefeller Bills
4. OSTP working group (2013)
5. National Commission on Forensic Science (2013-present)

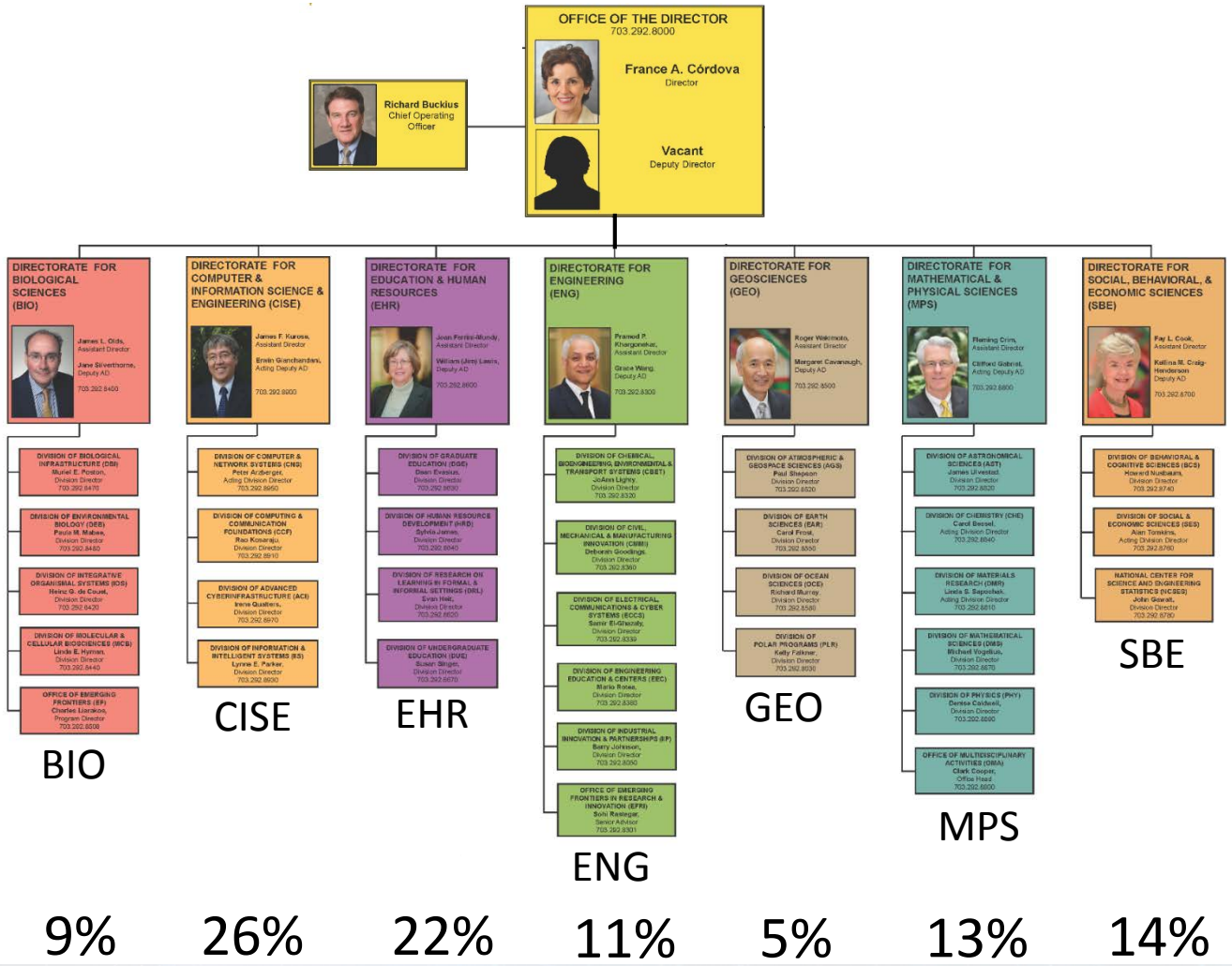
Two Forensic Science Dear Colleague Letters

1. NSF 13-120 (8/12/13) – Expresses interest in forensic-relevant basic research in any program at NSF
   (potential co-funding from NIJ)

2. NSF 14-066 (5/7/14) – Invites proposals for research sites that would establish a multi-site Forensic Science Industry/University Cooperative Research Center (IUCRC)
   (co-sponsored by NIJ; potential interest from other federal stakeholders)



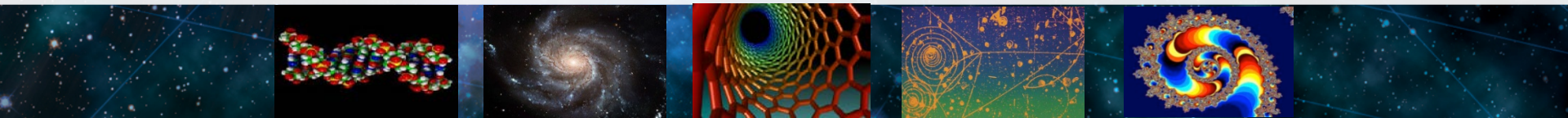
Distribution of 242 Active NSF Awards Mentioning* “Forensic Science”



*Abstract or title

NSF Investments in support of Forensic Science

	FY14	FY15
Training	$22 million (n=22)	$10 million (n=22)
Research and equipment (potential relevance)	$5.5 million (n=32)	$7 million (n=40)
Research and equipment (direct relevance)	$7.4 million (n=32)	$2.8 million (n=31)



Examples of Research Topics by NSF Directorate

SBE

Age-at-death estimation
Phenotypic variation
Cognitive bias
Visual Perception
Forensic Examiner and Jury Behavior

ENG

Forensic biology, chemistry, biometrics; technology and applications

EHR

Cybertraining; Undergraduate research experiences

MPS

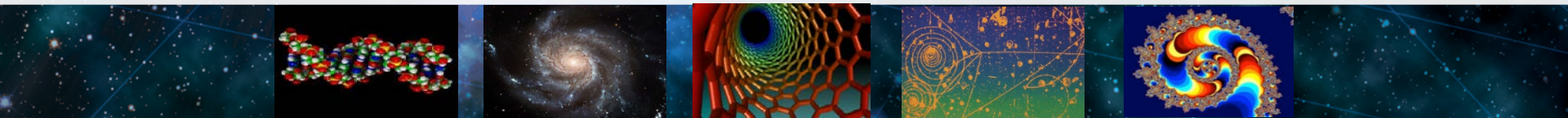
Methods for trace evidence analysis
Inverse problem
Mixture models

MRI

Research Instrumentation

CISE

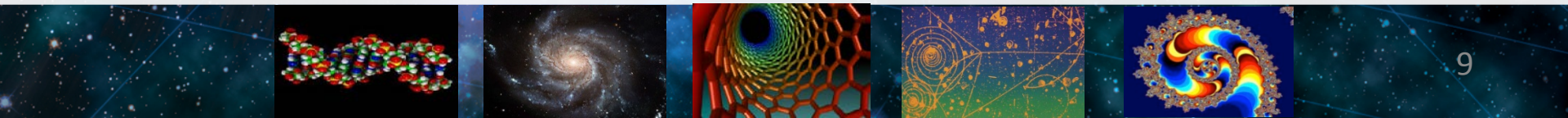
Cybercrime detection
Pattern matching
Human behaviors and security
Image and video analysis



Variation in human hair morphology within and among human populations

- Microscopic investigation of variability in human scalp hair features that lays the groundwork for future research linking hair form and color with their underlying genetics
- Use of recent technological advances in optical microscopy to identify variation in curl patterns, cross sectional dimensions, cuticle thickness, and orientation of cortical structures within and along the length of the hair shaft.

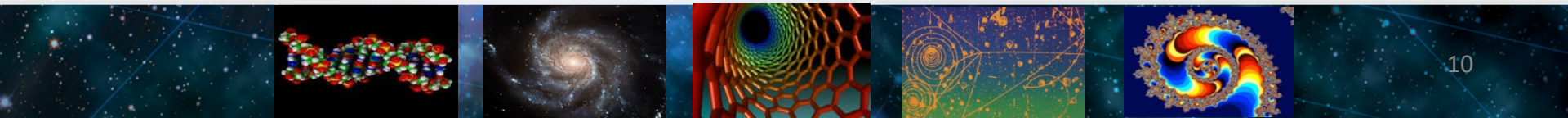
NSF award 1453571/Jablonski



Forensic Science Research Evaluation Workshop; AAAS-Washington, D.C.; May 26-27, 2015

- Improve capability within the forensic science community for greater scientific rigor in analytical methods
  - Experimental design and statistics
  - Interpretation and assessment
  - Policy implications and dissemination
- Ways to most effectively evaluate the forensic science literature

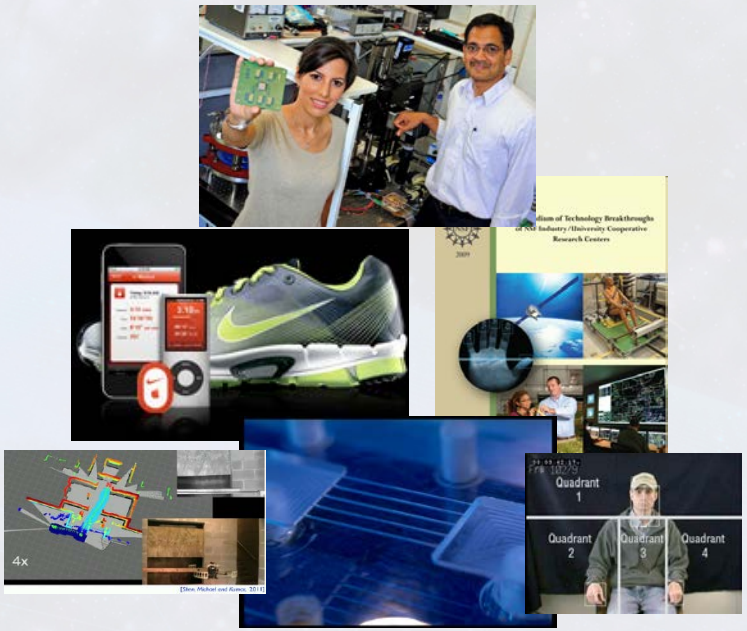
NSF award 1533843/Bartick



The Industry/University Cooperative Research Centers (IUCRC) Program

Mission:

- To contribute to the nation's research infrastructure base by developing long-term partnerships among industry, academe and government
- To leverage NSF funds with industry to support graduate students performing industrially relevant research

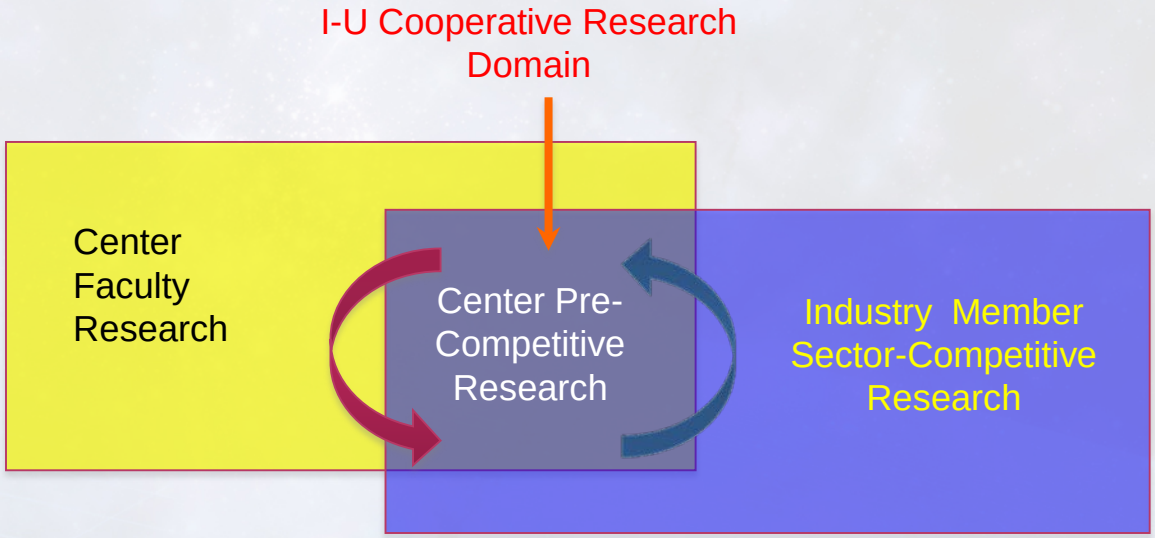


Vision:

- To expand the innovation capacity of our nation's competitive workforce through partnerships between industries and universities

Over 30 years of fostering and growing long-term trusted relationships between industry and academe based on shared value

What Value does an IUCRC Offer?

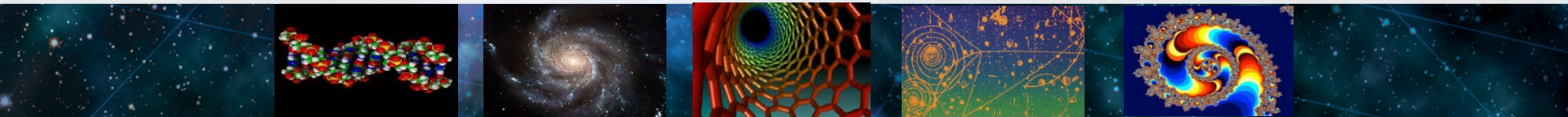


Value to Universities

- New research and education dimensions
- Student recruitment and placement
- Leveraging for new funding
- Ready partners for translation
- Means to achieve institutional mission

Value to Industry Members

- High value research projects
- Investment leveraging
- Access to all Center intellectual property
- Pre-publication research access
- Sector networking, learning from industry peers
- Access to students
- Access to faculty & facilities



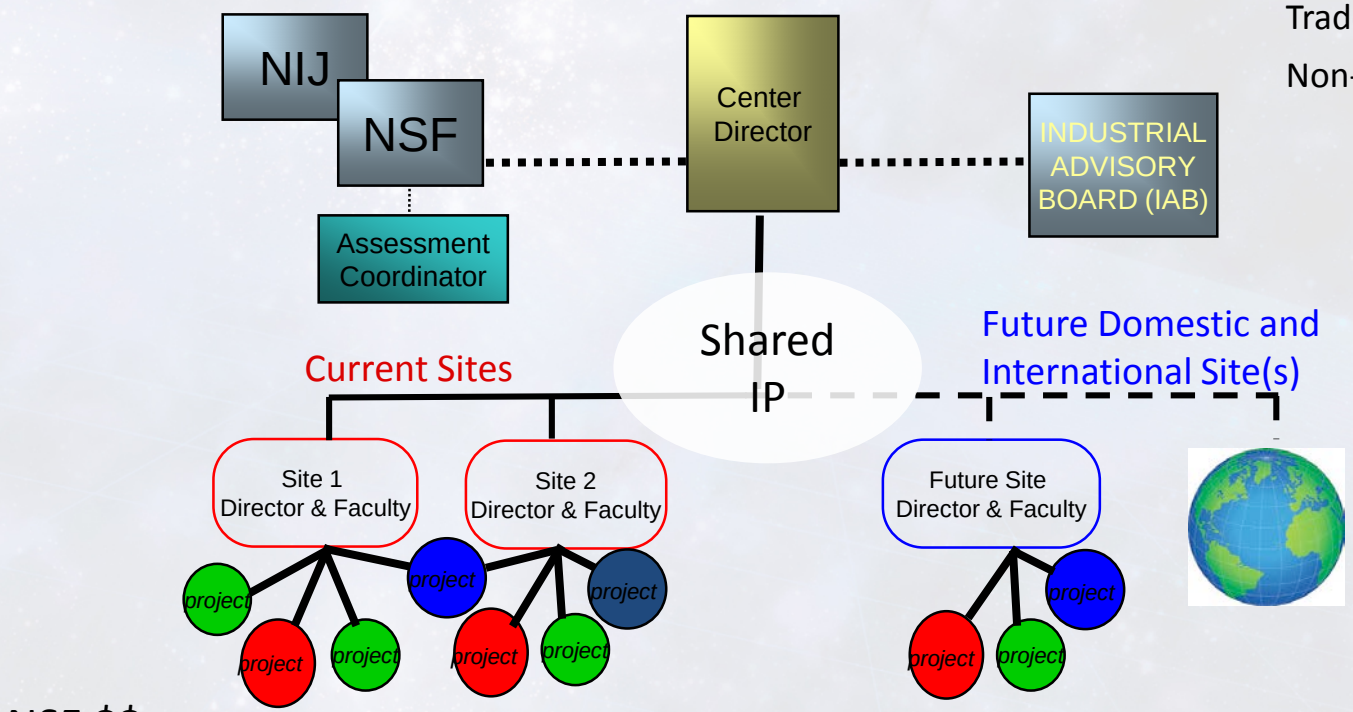
IUCRC Organizational Model

Private companies

Government agencies

Trade orgs & assoc.

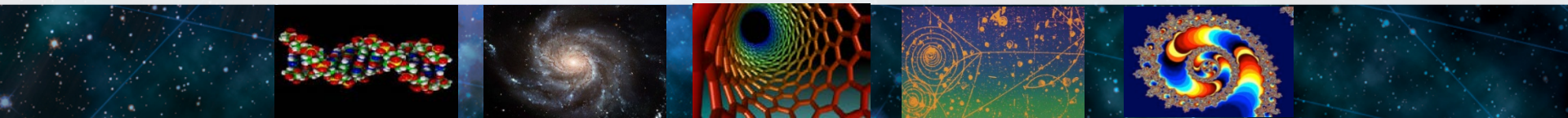
Non-profits



Center for Advanced Research in Forensic Science (IUCRC under development)

Awarded planning grants:

- California State University, LA – chemistry, biology, biomechanical engineering
- Florida International University – chemistry, DNA, impression analysis
- George Washington University – chemistry, DNA
- Iowa State University – psychology, chemistry, digital
- Northeastern University – chemistry, analytical methods
- Texas A&M – microbial forensics
- University of North Texas – microbial forensics
- University of South Alabama – digital
- West Virginia University – chemistry



Acknowledgements

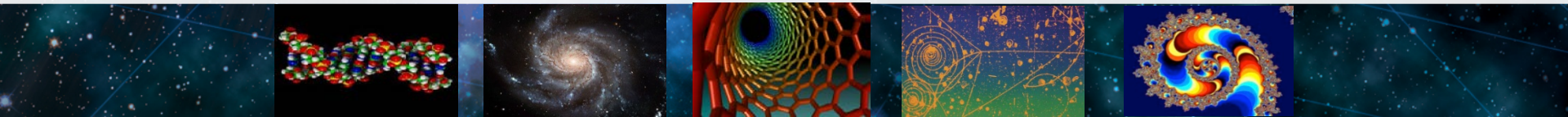
Dr. Kelsey Cook, MPS/CHE Program Director

Dr. Mark Weiss, former SBE/BCS Division Director

NIJ Office of Investigative and Forensic Sciences

NSF/SBE Front Office

IUCRC Program Directors



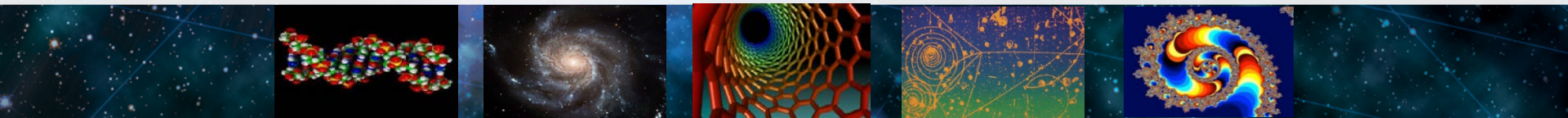
IUCRC Process

CENTER DEVELOPMENT

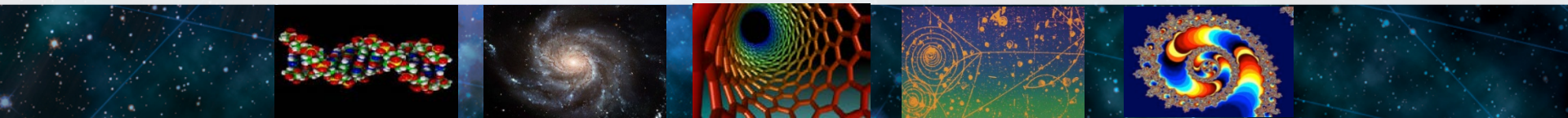
- Identification of center theme and industry interest across one or more potential university sites
- Letters of Intent and Planning Grant proposals
- **Planning meeting: projects and feedback**
- Full proposal: commitment of $150K or more (or $400K for a single-site center) with 3+ members per site
- NSF peer review

AWARDED CENTER

- NSF funds to each research site:
  - $150K/year (years 1-5),
  - $100K/year (years 6-10)
  - $50K/year (years 11-15)
- Member funds
  - $150K+ per site/year
- Industrial Advisory Board (IAB)
  - ALL industry/agency members represented
  - Meet twice per year
  - Recommend projects, bylaws
  - Interaction with NSF (ex-officio)
  - Assessment coordinator
- *Members have access to research across all sites in the center* and additional sites may join the existing center



Additional Examples of NSF Awards related to the Forensic Sciences

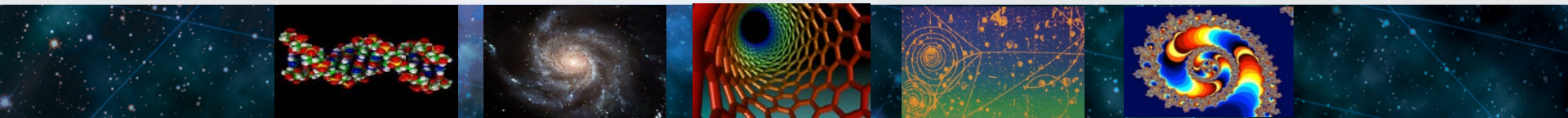


Advanced Raman Spectroscopic Methods for the Identification of Trace Evidence

To develop methods for the evaluation of trace evidence and the examination of questioned documents by surface-enhanced Raman scattering.

- Non-destructive methods development
- Development of searchable spectral library of substances of forensic interest such as organic dyes and pigments, pharmaceuticals, and drugs of abuse.

NSF grant 1402750/Lombardi

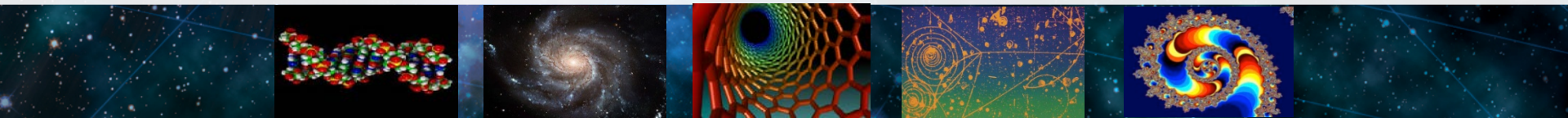


DNA Examiners: Judgement and Influence

To investigate whether task-irrelevant contextual information can affect scientific decision making. Specifically, does a DNA examiner's decision about how to test an object for DNA depend on contextual cues?

- Real DNA examiners and mock jurors
- Does contextual information from a simulated criminal case affect DNA analysis outcomes?
- Does this information affect how examiners testify, how well jurors understand, and what jurors decide?

NSF award 1356899/Koehler

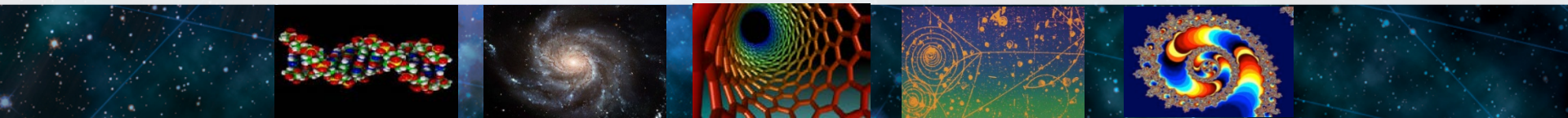


Perceptual Categorization in Real-World Expertise

To understand how fundamental perceptual and cognitive mechanisms are tuned and modified by experience and expertise. Relevant for forensic science disciplines that involve a human expert and/or pattern matching.

- Latent fingerprint examiners and novices
- What is the normal range of variation in perceptual expertise?
- Are there predictive markers of perceptual expertise?

NSF award 1257098/Palmeri

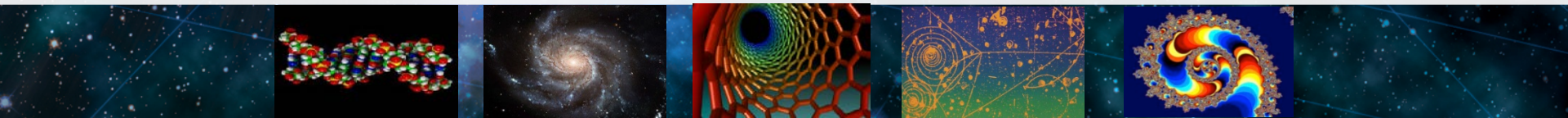


Memory and Jury Deliberation: The Benefits and Cost of Collective Remembering

To understand how group dynamics and conversation can affect group and individual memory and recall. Relevant for juries.

- Mock jurors.
- Do previous research findings on other groups hold true for juries?
- Are there ways to mitigate biases generated by “collective remembering” in a jury setting?

NSF award 1423727/Hirst & Stone



NSF Related Links

Main NSF Website
www.nsf.gov

NSF Award Search
https://nsf.gov/awardsearch/advancedSearch.jsp

NSF 2014-2018 Strategic Plan
https://www.nsf.gov/pubs/2014/nsf14043/nsf14043.pdf

NSF IUCRC Program
https://www.nsf.gov/eng/iip/iucrc/home.jsp

Collaborations with other Federal Agencies
https://nsf.gov/about/partners/fedagencies.jsp