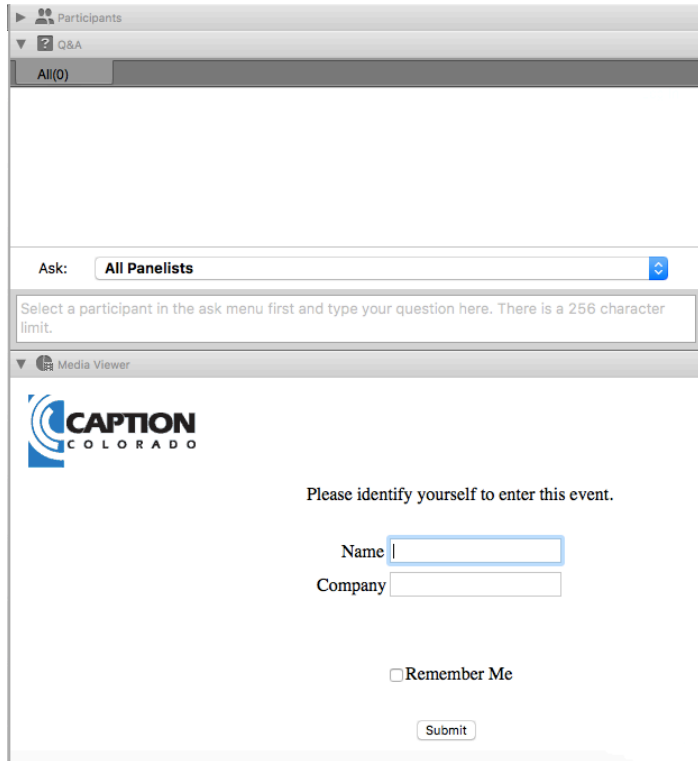# Perception and Cognition Research to Inform Cancer Image Interpretation

Behavioral Research Program

Using WebEx and webinar logistics

- Submit questions at any time during the presentation. Type into the Q&A feature on the right of the interface and press "submit"

  - Closed captioning is available by selecting the Media Viewer Panel on the right hand side of your screen

- To connect to the live audio, we recommend having the system call you. Enter your telephone number (include area code) and select "Call Me" OR dial in to the session at:

  - Conference #: 1-855-244-8681
    Access Code: 738 883 465

- This webinar is being recorded

Webinar presenters

- **Moderator:** Paige Green, PhD, MPH
  Chief, Basic Biobehavioral and Psychological Sciences Branch, NCI

- **Speaker:** Todd Horowitz, PhD
  Program Director, Basic Biobehavioral and Psychological Sciences Branch, National Cancer Institute (NCI)

- **Technical Experts:**

  Lalitha Shankar, MD, PhD, Chief, Clinical Trials Branch, Division of Cancer Treatment and Diagnosis, NCI

  Vinay Pai, PhD, Director, Division of Health Informatics Technologies, National Institute of Biomedical Imaging and Bioengineering
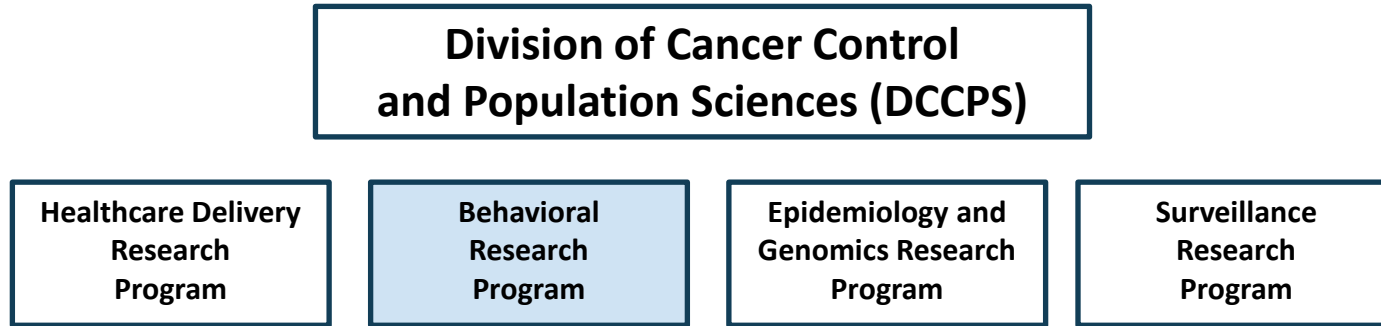
Agenda

- Background

- FOA Details

- Resources

- Questions

  - Questions about specific aims or grant application details will not be addressed

Background

Perception and Cognition Research to Inform Cancer Image Interpretation

NCI DCCPS organizational structure

Division of Cancer Control and Population Sciences (DCCPS)

Healthcare Delivery Research Program	Behavioral Research Program	Epidemiology and Genomics Research Program	Surveillance Research Program

The **Behavioral Research Program (BRP)** initiates, supports, and evaluates a comprehensive program of research including basic behavioral and psychological science as well as the development, testing, and dissemination of interventions in cancer control areas such as tobacco use, diet and energy balance, and sun protection.

cancercontrol.cancer.gov/brp/

How we fund grants

- Although most of our portfolio consists of investigator-initiated (unsolicited) grants, BRP also supports grant applications in specific areas of interest

  - Requests for Applications (RFA)

    - Identifies the specific receipt date(s), the estimated amount of funds earmarked for the initiative, the number of awards likely to be funded, and any specific criteria for scientific peer review; applications received in response to a particular RFA are reviewed by an Institute's Scientific Review Group

  - Program Announcements (PA)

    - Most PA applications are submitted with a standing receipt date and are reviewed with all other applications received at that time using standard peer-review processes

  - Program Announcement (PAR)

    - Program announcements with special receipt, referral, and/or review considerations

Grant mechanisms – R01 and R21

NIH Research Project Grant (R01)	NIH Exploratory/Developmental Grant (R21)
- Support a discrete, specified, and circumscribed research project - Most commonly used grant program - No specific dollar limit - Advance permission required for ≥$500K direct costs in any year 3-5 years funding	- Supports new, exploratory, and developmental research projects - Sometimes used for pilot and feasibility studies - Preliminary studies are discouraged - Combined budget for direct costs for the two-year project period usually may not exceed $275,000 - Up to 2 years funding

For more information: grants.nih.gov/grants/funding/funding_program.htm#RSeries
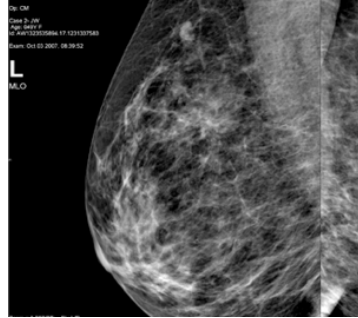
FOA Details

Perception and Cognition Research to Inform Cancer Image Interpretation
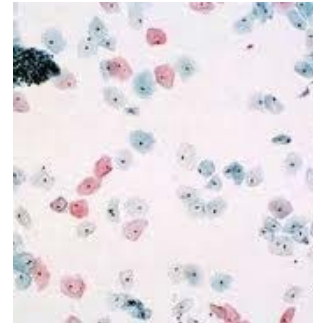
Motivation

- Cancer imaging is a crucial component of detection and diagnosis

  - Mammography, colonography

  - Digital microscopy

  - PET-CT

- Performance of human observers is a critical (and neglected) factor in cancer imaging

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Errors in cancer detection and diagnosis

- **Breast cancer screening**
  - Missed cancers: 9.7%
  - False positives: 15.1%

- **Low-dose lung CT**
  - Missed cancers: 38.8%
  - False positives: 23.6%

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Perceptual or cognitive errors are a major source of diagnostic errors

IOM Committee on Diagnostic Error in Health Care (2015)

Perceptual error

Cognitive error

Purpose of PAR

- Solicit research on perceptual and cognitive mechanisms underlying performance of cancer image observers

  - Cancer image observers: radiologists, pathologists, etc.

- Promote synergy of basic and applied perception research

- Improve accuracy of cancer detection and diagnosis

# Synergy of basic and applied perception research

- Assumption: Cancer observers use the same visual systems as the rest of us

  - Insights from basic perceptual research can help understand cancer image interpretation

  - We can study the problems faced by cancer observers in perceptual laboratories, using non-expert observers

- Promising hypotheses can then be tested using expert cancer observers

Informing cancer imaging practice

- What are the effects of high prevalence on perception; how do we identify what is normal?

- Why do radiologists reading film find it harder to detect tumors in dense breasts than in fatty breasts, but vice versa for digital mammograms?
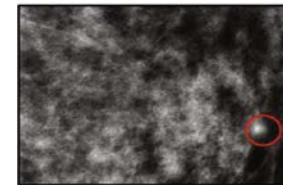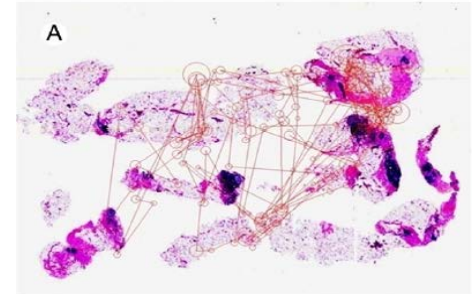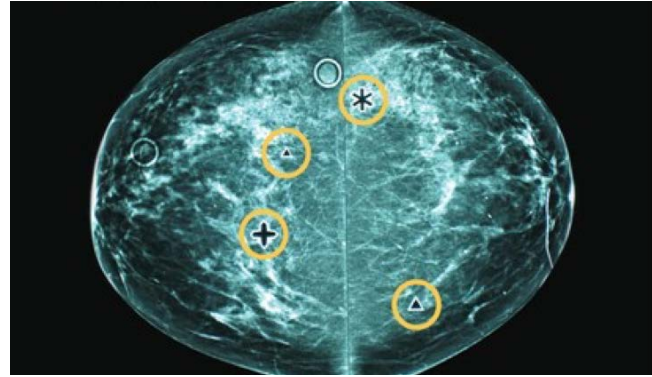

Dense Tissue
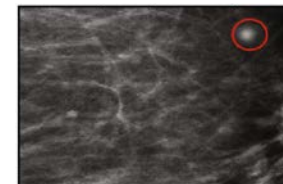
Fatty Tissue

Informing cancer imaging practice

- Why does computer-aided detection (CAD) not improve cancer detection?

- How can we develop systematic, evidence-based techniques for training clinicians to interpret cancer images?

Not responsive

- Reader studies of new hardware/software

- Purely descriptive studies of medical image interpretation

- Basic perceptual research that is only marginally related to medical/cancer image perception

What is NCI looking for?

- Cross-disciplinary collaborations

- Cancer context

- Move both basic and applied fields forward

- International contrasts

What is NIBIB looking for?

- **Focus on development of new technologies and methodologies.**

- Newer visualization systems (augmented reality, mobile platforms)

- Development of advanced machine learning approaches (not "reuse" of existing techniques)

- Multidimensional data (4D) analytics

- Image perception with sparse data

- High-performance computing based algorithm development.

Important considerations

- Mechanism
  - R21 vs R01
- PAR means
  - Special review
  - No set-aside
  - Multiple receipt dates
- International applications welcome

Resources

Perception and Cognition Research to Inform Cancer Image Interpretation

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Read the FOAs very carefully!

- PAR-17-124 (R21); PAR-17-125 (R01)

- Open Date (Earliest Submission Date): April 30, 2017

- Application Due Dates: May 30, 2017; September 26, 2017; May 30, 2018; September 26, 2018; May 30, 2019; September 26, 2019

- Letter of Intent Due Date: 30 days prior to the application due date

Read the FOAs very carefully!

- Earliest Start Date: April 2018; August 2018; April 2019; August 2019; April 2020; August 2020

- Expiration Date: September 27, 2019

- Start the process early! Allow time for registration in the System for Award Management, eRA Commons, and Grants.gov
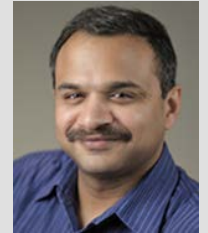
Program contacts

National Cancer Institute (NCI)	National Institute of Biomedical Imaging and Bioengineering (NIBIB)
Todd Horowitz, PhD todd.horowitz@nih.gov 240-276-6963	Vinay Pai, PhD paiv@mail.nih.gov 301-451-4781 Andrew Weitz, PhD andrew.weitz@nih.gov 301-451-4713
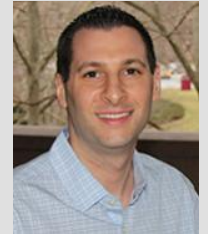
Resources for new funding announcements

- Today's webinar and list of FAQs (both leading up to and following the webinar) will be posted online:

  - http://cancercontrol.cancer.gov/funding-foa-applicants.html

  - There, you can also find links to FOAs and Program Director contact information

- Connect with any BRP staff member via contact information listed on:

  - http://staffprofiles.cancer.gov/brp/

  - Email questions to BRP anytime at ncidccpsbrpadvances@mail.nih.gov

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Questions

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