

Facilitating & Experiencing Interdisciplinarity in Biomedical Research: Mid-Course Evaluation of the Interdisciplinary Research Consortium Program

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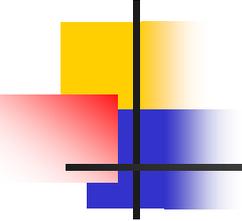
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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

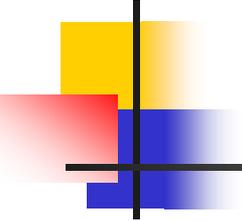
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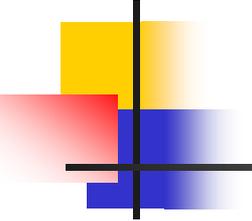
Presentation Overview

- Interdisciplinary Research Work Group (NIH Roadmap)
 - Program Description
 - Evaluation
 - Feasibility Study, 2006 (DPCPSI set-aside funds)
 - Mid-course evaluation, 2008-2011 (DPCPSI set-aside funds)
- Midcourse evaluation: key questions & methods
- Primary findings
- Facilitators and inhibitors of IDR, Conclusions
- Discussion
 - Utility of findings to program leadership
 - Status of IDRWG programs
 - Q&A



NIH Roadmap for Biomedical Research

- The 2006 NIH Reform Act called for the NIH Common Fund to support important areas of emerging scientific opportunities, rising public health challenges, or knowledge gaps that deserve special emphasis and would benefit from conducting or supporting additional research that involves collaboration between two or more national research institutes or national centers, or would otherwise benefit from strategic coordination and planning. To this end, the Common Fund programs encourage transformative research that tackles the most critical challenges in biomedical research and translation. These are short term (5-10 year) programs that are intended to solve problems or build resources that will then catalyze research throughout the entire biomedical research enterprise.



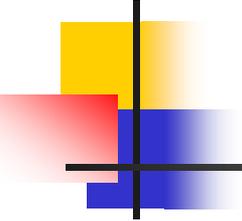
NIH Interest in Interdisciplinary Research

- *Interdisciplinary research integrates the analytical strengths of two or more often disparate scientific disciplines to create a new hybrid discipline. By engaging seemingly unrelated disciplines, traditional gaps in terminology, approach, and methodology might be gradually eliminated. With roadblocks to potential collaboration removed, a true meeting of minds can take place; one that broadens **the scope of investigation** into biomedical problems, yields fresh and possibly **unexpected insights**, and gives rise to **new interdisciplines** that are more analytically sophisticated. By establishing new awards aimed at building interdisciplinary research teams, NIH hoped to help **accelerate research** on diseases of interest to all of its components with an eye toward improving the nation's public health.*
- <http://www.nihroadmap.nih.gov/interdisciplinary/>

NIH Interdisciplinary Research Consortium Program



The IDRC program provides a unique approach to research that allows self-assembly and integration of multiple research components, including training, core services, research projects, and pilot studies, that address a common biomedical research topic. Each consortium has multiple grant awards associated with it, and, collectively, they compose the interdisciplinary program. NIH program officers from different institutes and centers manage the individual awards.



Program Goals for the IDR Consortia

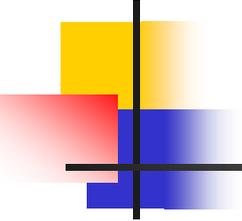
- Encourage the integration of different scientific disciplines to develop new intellectual and technological approaches to complex health problems
- Support IDR approaches to solving significant and complex biomedical problems, particularly those that have been resistant to traditional approaches
- Catalyze the creation of new disciplines
- Conduct interdisciplinary research within the context of a team

Note: Each Consortium selected one health problem

Interdisciplinary Research Consortia (IDRC)

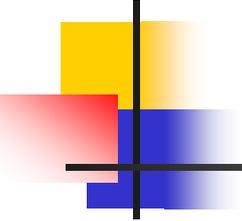
Interdisciplinary Research Consortium (IRC)	PI Name	Head Institution	Participants	Clinical Implication
CNP: Consortium for Neuropsychiatric Phenomics	Dr. Robert Bilder	UCLA Los Angeles, CA	7 linked grants	Neurophysiology and neuropsychiatric disorders
NTRI: NeuroTherapeutics Research Institute	Dr. Paul Hagerman	UCD Davis, CA	5 linked grants	Neurotherapeutics, neurodevelopmental disabilities and disorders
TORS: Taskforce for Obesity Research at Southwestern	Dr. Jay Hotron	UTX Dallas, TX	8 linked grants & Training Program	Endocrinology, obesity, diabetes & metabolism
GERO-SCIENCE: Interdisciplinary Research Consortium in Geroscience	Dr. Gordon Lithgow	BUCK Institute Research on Aging Novato, CA	7 linked grants & Training Program	Neurodegeneration and Aging
SYSCODE: Systems-based Consortium for Organ Design and Engineering	Dr. Richard Maas	Brigham and Women's Hospital, Harvard Medical School Boston, MA	9 linked grants & Training Program	Organ parts regeneration
NGEC: Northwest Genome Engineering Consortium	Dr. Andrew Scharenberg	Children's Hospital Seattle, WA	8 linked grants & Training Program	Monogenic lymphohematic disorders
GBDD: Genomics-Based Drug Discovery	Dr. Christina Scherer	The Broad Institute Cambridge, MA	3 linked grants	Drug discovery
IRCSSA: Interdisciplinary Research on Stress, Self-control and Addiction	Dr. Rajita Sinha	Yale University New Haven, CT	13 linked grants	Addiction to tobacco smoking, alcohol, and eating disorders
ONCO-FERTILITY: the Oncofertility Consortium	Dr. Teresa Woodruff	North Western Chicago, IL	8 linked grants & Training Program	Fertility preservation for women with cancer





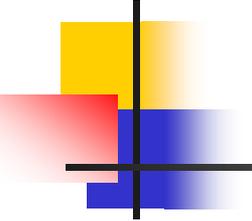
History of Evaluation of IDRWG

- Feasibility Study
 - Report issued Nov 2006
 - Presentation to EvalSIG, 2006 or 2007
- Process Evaluation Study
 - Challenges to the evaluation
 - Evaluation findings might be irrelevant to renewal or recompetete decisions
 - Investigators were unfamiliar with evaluation
 - Final report issued Sept 2011
 - Presentation to EvalSIG, Dec 2011
 - Active dissemination



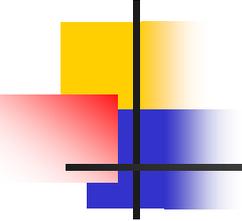
Outcome Logic Model

Short-term Outcomes	Intermediate-term outcomes	Long-term & final outcomes
Years 1-2	Years 3-5	Years 4-6
<p><i>Outcomes of interest</i></p> <p>Program management Project management Collaboration & new organizational models Communication Fidelity to application</p>	<p><i>Outcomes of interest</i></p> <p>Investigator development New or improved methods, models, or theories Research quality & productivity Trainees develop IDR knowledge base and research skills</p>	<p><i>Outcomes of interest</i></p> <p>Improved interventions Emergence of a new field Translation to practice Dissemination Achievement of NIH project goals & objectives Health impact Trainees move to next phase in the IDR pipeline</p>



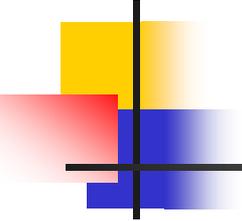
Key Evaluation Questions

- What leadership qualities supported interdisciplinarity at the project level?
- How did the experiences of investigators differ from their previous experiences?
- What structural features were put in place at the project level to support interdisciplinarity of research and training?
- How did the experiences of post-doctoral trainees differ from their previous experiences?
- How did trainees predict that their interdisciplinary training would affect their careers?
- How did management of interdisciplinary research differ from management of other biomedical research?
- What management issues arose, both at the project (grantee) and program (NIH) level and how were these resolved?



Evaluation Methods

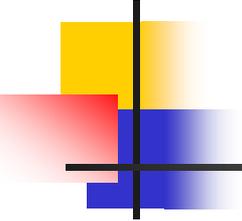
- Guided interviews of Principal Investigators and NIH Program Officers
- Observations of investigator meetings
- Surveys of investigators
- Guided interviews and ratings by post-doctoral researchers
- Document reviews
- Social network analysis
- Bibliometric analysis



Scientific Productivity within the IDR Consortia

- Research Publications (total)
 - Range: 8 -73
 - Median: 35
- Impact Factor (upper limit)
 - Range: 5-29
 - Median: 24
- Times cited (no self-citations)
 - Range: 61-1094
 - Median: 194

Analysis of research publications, NIAID eSPA, project start to 3/11



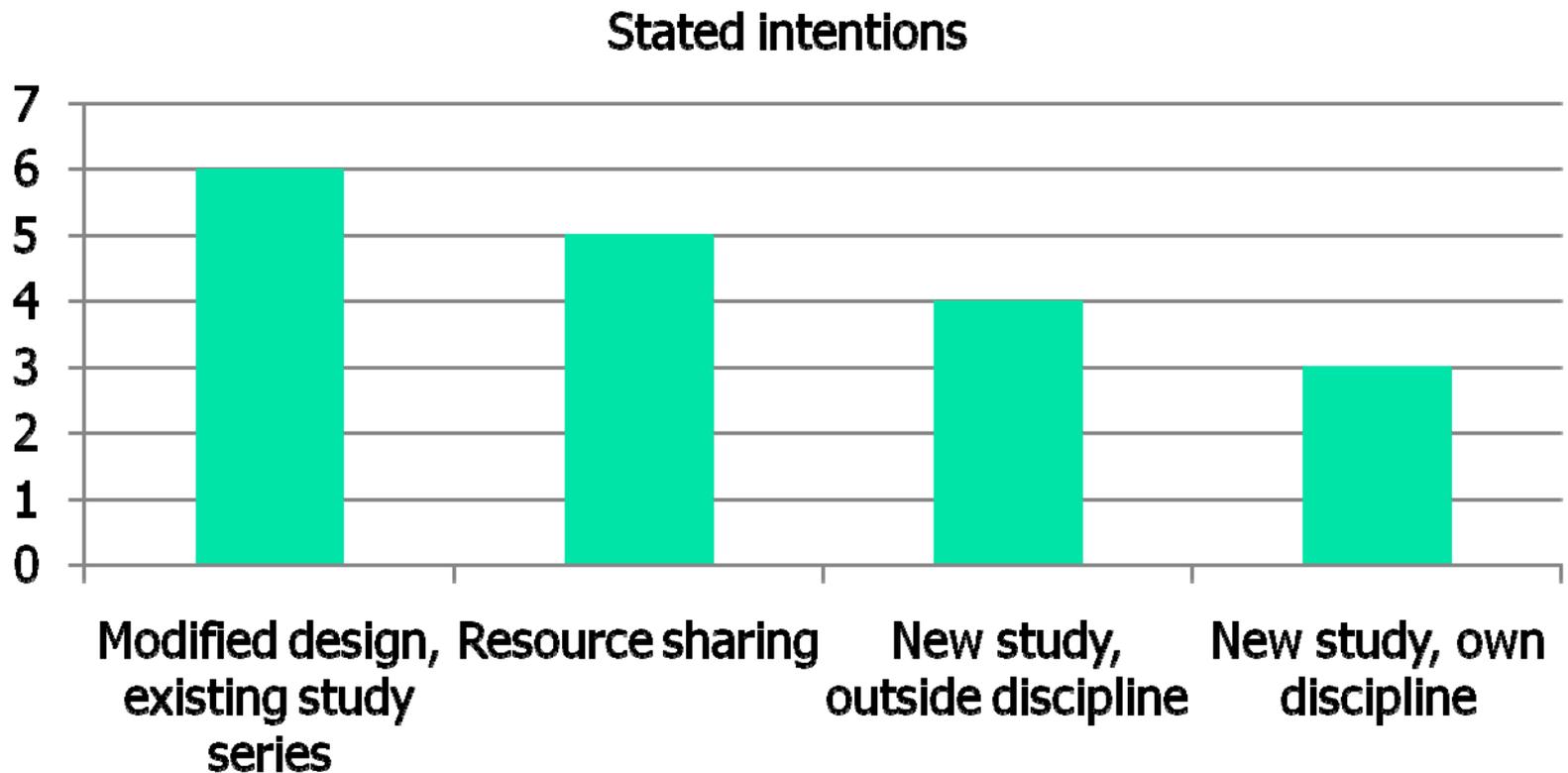
Leadership Qualities that Supported IDR

- Our investigators were committed to interdisciplinary collaboration (76)
- The consortium environment was collaborative [not] competitive (72)
- The complementary research interests and expertise in participating laboratories facilitated collaboration (70)
- Intellectual contributions made by more than one investigator were valued (70)
- The consortium leadership facilitated collaboration (68)
- Investigators were exposed to divergent points of view that positively affected thinking or research (64)

Method: Investigator Survey (N=105)

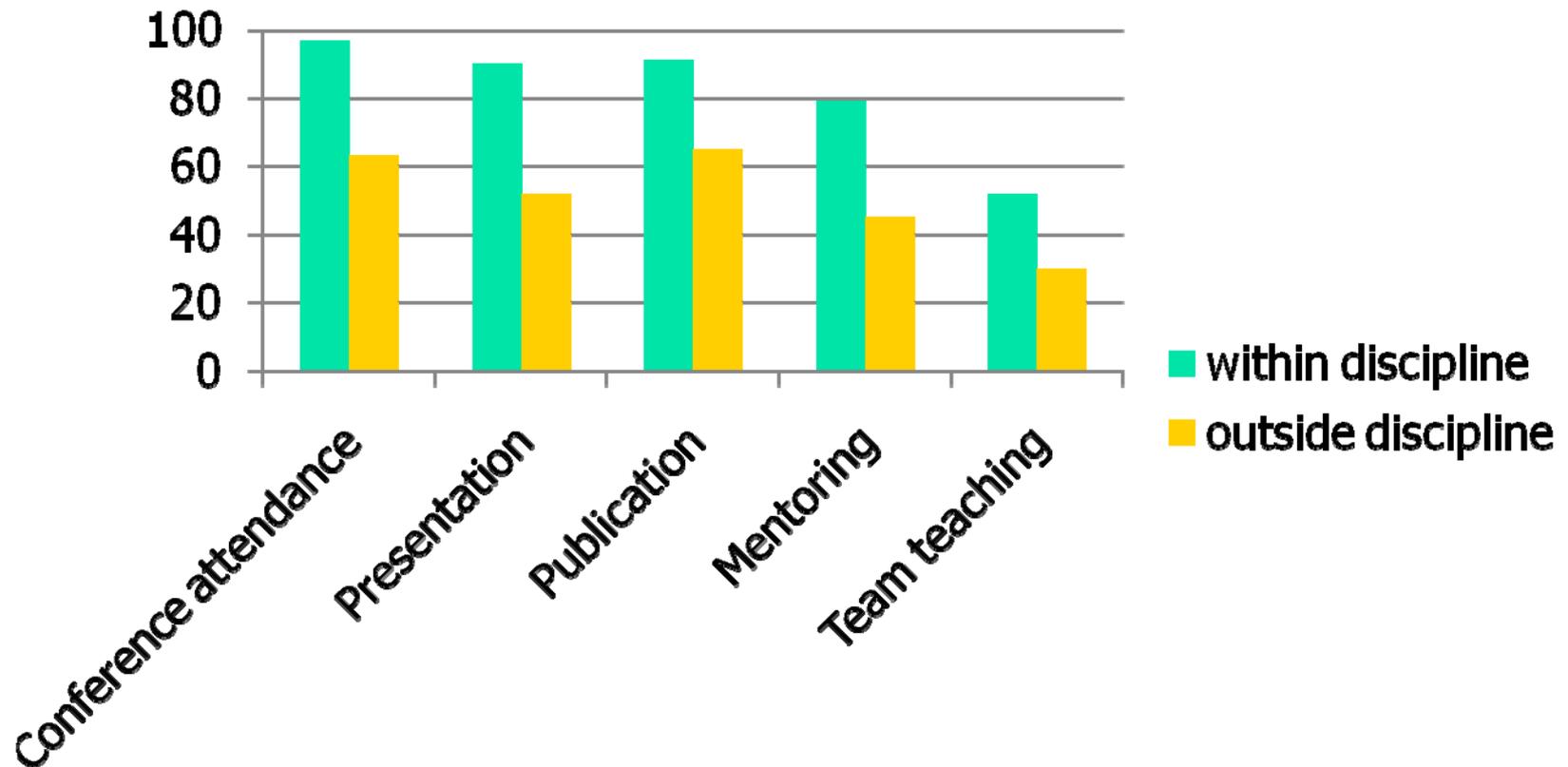
Numbers in parentheses show the percent that "Strongly Agree"

Results of Meetings of Investigators from Multiple Disciplines

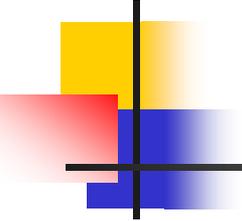


*Method: observations of scientific meetings,
conducted at 7 Consortia*

Scientific Productivity of Investigators Observed in Multiple Disciplines



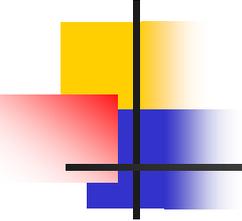
Method: Investigator Survey, N=105, Percent of respondents who engaged in the activity in the last six months



Changes in Investigators' Opinions and Activities

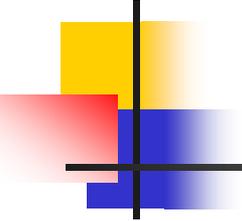
- “The Consortium has redefined my opinion of the optimal way in which basic and translational research should be performed to maximize new insights, progress, & the overall public benefit to be gained from our federal investment.”
- “The Consortium has been the single biggest contributor to my growth and development as a Principal Investigator. I was given unbelievable access to highly respected members of the research community and to shared resources ... [which] allowed me to publish two high quality papers that would have been impossible had I worked only in my own department.”

Method: Investigator Survey, N=105



Summary of Changes in Investigator Activities and Behaviors

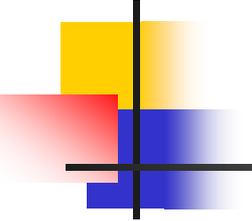
- Frequent meetings with investigators from multiple disciplines to discuss research methods for a specific medical condition
- Expansion of research vocabulary and research portfolio to Consortium disciplines
- Scientific productivity in multiple disciplines
- Confidence and excitement about IDR within a team context
- Co-mentoring of trainees from various Consortium disciplines
- Sharing of resources toward a common research purpose



Structural Features of the Interdisciplinary Training Experience

- Dual mentorships
- Structured interactions with senior investigators (seminar series, progress report meetings) re: specific research projects, including trainee's projects
- Informal interactions with senior investigators (accessibility)
- Training outside trainee's main lab (shared resources) on specific equipment or specific research methods
- Lab meetings outside trainee's main lab
- Structured reading and learning beyond trainee's main field
- Contribution of knowledge and expertise from trainee's main field to trainees and investigators in other fields

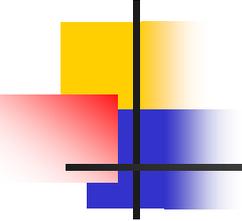
Method: Interviews with 42 trainees



Scholarly Experiences of Trainees

- Team research projects (80% now; 48% prior)
- IDR outside a course setting (68% now; 30% prior)
- Courses with an IDR focus (64%, 36%)
- Mentoring by faculty in multiple disciplines (77%, 50%)
- Courses outside home department (57%, 32%)

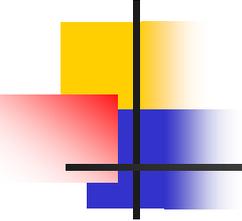
Method: Interviews with 42 trainees asked to rate frequencies of specific scholarly activities during their Consortium experience and in the two years prior to their involvement with the Consortium. The largest increases in specific interdisciplinary activities are shown.



Scholarly Experiences of Trainees, cont.

- 30/42 (71%) had either published or presented Consortium research findings at a national conference.
- 22/42 (52%) shared authorship on a paper accepted for publication by a peer-reviewed science journal based on their work in the Consortium.
- 11/42 (26%) had written and submitted, usually as a member of a team, a grant proposal.

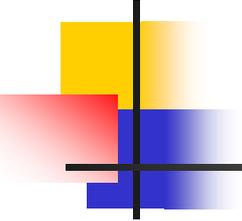
Method: Interviews with 42 trainees



Trainee Career Predictions

- “The interdisciplinary training will definitely help me. Before I was here, during my PhD studies, I always thought of doing a more focused study. Interdisciplinary training really helped me think about other approaches, how to apply techniques at a systems level. The translational aspects are also more apparent with an interdisciplinary approach. ”
- “I am being prepared to be hireable by multiple departments (Internal Medicine, Pharmacology, Psychiatry). I am better prepared in terms of diverse skills (ability to frame a research question, employ specific research techniques, interact with a variety of investigators) than someone trained in a single discipline.”
- “I am looking for a job in academia now, but I am not well prepared to teach an undergraduate core course. It might have been better to go for a mainstream engineering degree and do a dissertation on bioengineering. There is no way to get teaching experience within the Consortium because the focus is on research. A biomedical PhD might be too specialized, an amalgamation.”

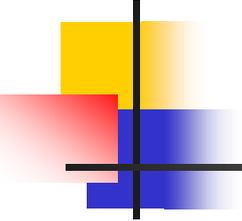
Method: Interviews with 42 trainees



Management of Interdisciplinary Research: Guided Interview Topics for NIH Program Officers

- Differences between managing interdisciplinary and single discipline grants
- Training to manage interdisciplinary research (IDR)
- NIH policies and procedures for managing IDR
- Experience with Program Coordinators
- Administrative issues with RL1 grants
- Managing projects outside home IC
- Alignment of IDRWG initiatives with home IC 's mission
- Establishment of new collaborations
- Predicted outcomes and long-term impact of IDR
- Transitioning projects from Common Funds
- Opinions about successful IDR

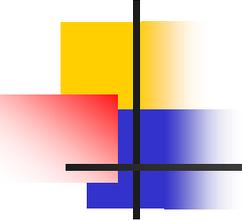
Method: Interviews with 10 NIH Program Officers



Summary of NIH Program Officer Interviews

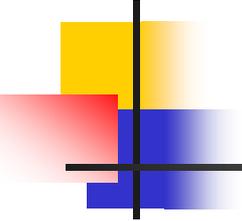
- IDR is a novel and innovative approach to solving complex problems
- Scope and scale of IDRC projects would not be possible without cross-institute collaboration and use of Common Fund resources
- Hope that the IDRC program will continue
- Suggestions and comments made to facilitate management within NIH
- ...a “great demonstration project; and now we really need to institutionalize it. ”

Method: Interviews with 10 NIH Program Officers



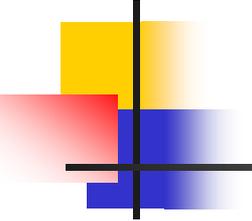
Advancing the Science of Team Science: Facilitators of Interdisciplinarity

- Dedication to a single medical or public health problem, narrowly defined
- Funding for an administrative core
- Investigator interactions – face to face
 - Research progress review & planning (specific experiments and methods)
 - Senior investigator meeting or seminar series
- Flexibility in funding to allow expansion of research plan, rapid response to research findings, and expansion of investigator team
- Scientific Advisory Boards and Annual Meeting, especially when combined with NIH site visit
- Shared equipment (non-IT)



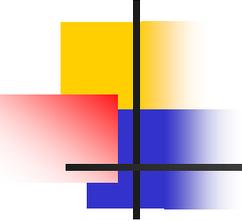
Advancing the Science of Team Science: Inhibitors of Interdisciplinarity

- Dedication to a single medical or public health problem, broadly defined
- Geographic dispersion
- Weak link between clinical activities and clinical research
- Management of clinical trials
- Temporally sequenced set of research activities such that many specific investigations could not be initiated until other activities were completed



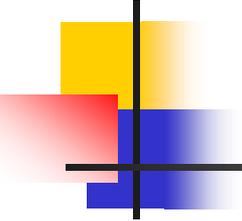
Conclusions from the Evaluation

- Program requirements established by NIH
 - Cross-Institute resources
 - Interdisciplinary teams and interdisciplinary training
 - Shared focus on one biomedical problem
- Observed changes in structure and organization
- Observed changes in scientific engagement in a select group of scientists and trainees
- Observed scientific productivity and discovery
- To be discovered: Do changes in scientific engagement and organization result in improved (faster, better) medical treatments that benefit the public ?



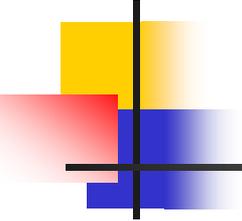
Discussion

- Utility of Findings to Program Leaders
- Status of IDRWG programs
- Q&A



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