Concept Clearance for Genomic Technology Development

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NACHGR

Outline of Presentation

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- Timeline
- Two initiatives
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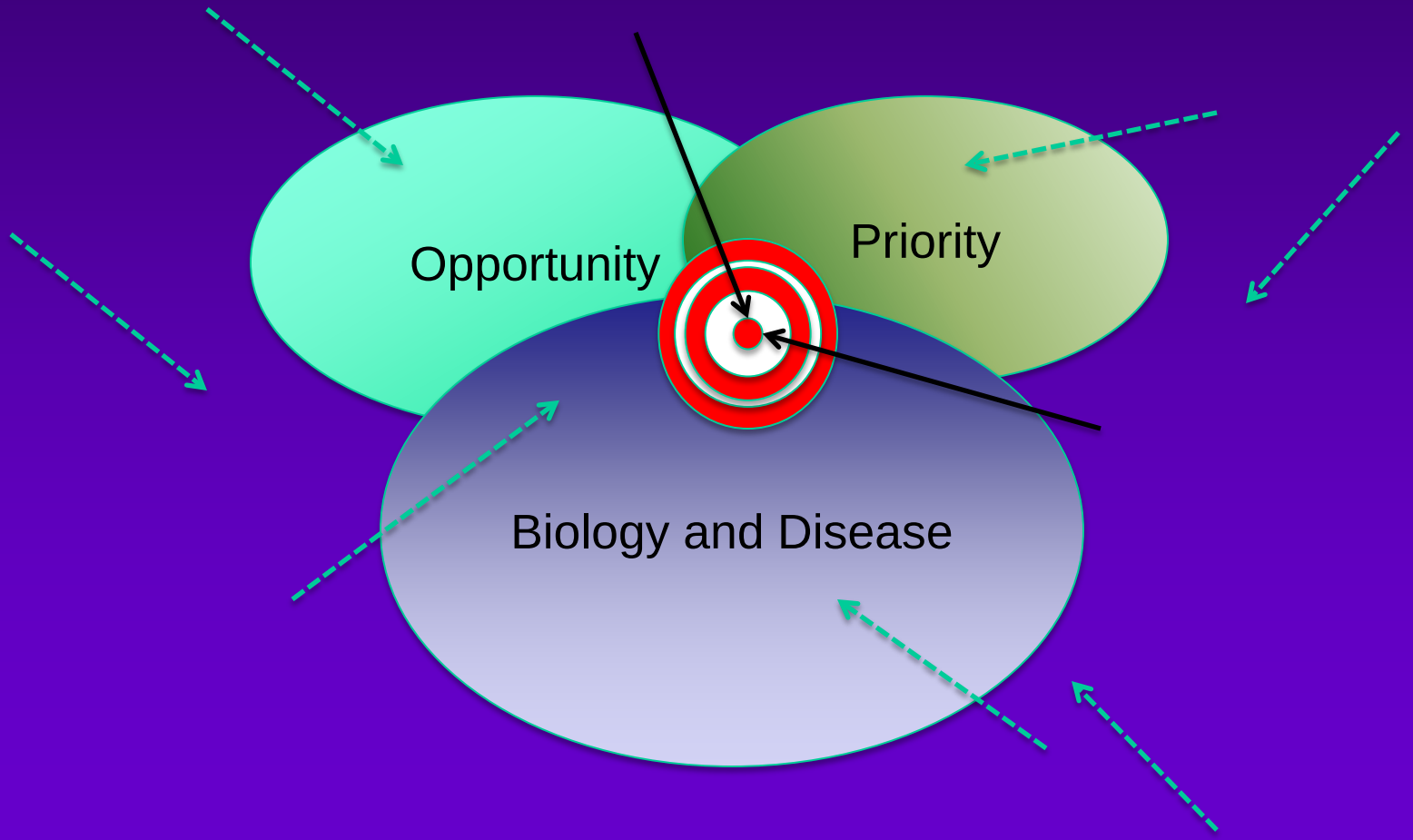
  - Scope and Objectives
  - Mechanisms of Support
  - Budget
  - Potential research topic examples
- Overall Budget

Workshop Participants

April 10
Mark Chee
Joe Ecker
Andy Feinberg
Chuan He
Jonas Korlach
Chris Mason
Steve McCarroll
Chad Nusbaum
Mike Snyder
Marc Vidal

April 16
George Church
Steve Fodor
Hanlee Ji
Pui-Yan Kwok
Andre Marziali
Deirdre Meldrum
Donna Muzny
John Nelson
Steve Quake
Aviv Regev
Jay Shendure
David Walt
Bob Waterston

Workshop charge



General Workshop Recommendations

- Technology development continues to be sorely needed across a wide swath of genomics
  - A strong need for new DNA and direct RNA sequencing methods
  - Many and diverse areas of opportune and relevant priorities
  - Details provided in the initiatives
- Technology opportunities best identified by investigator interests
- Applications benefit from dedicated review and solicitation

Concept - Overall Goals

- Facilitate development of novel genomic technologies
- Specifically solicit novel technologies for nucleic acid sequencing technology development
- Provide a new avenue of support and dedicated review for broadly defined genomic technology development

Initiatives

1. **Novel Nucleic Acid Sequencing Technology Development**

2. **Genomic Technology Development Awards**

1- Novel Nucleic Acid Sequencing Technology Development

- Purpose: Develop revolutionary nucleic acid sequencing technologies
- Scope and Objectives: Support new DNA and direct RNA sequencing technologies and chemistries to develop transformative and foundational nucleic acid sequencing technologies with long read lengths, high accuracy and low cost.
- Mechanism of Support and Budget
  - $2M TC in additional RPG funding/year; four years (FY16-19); RFAs
  - 2-4 awards each year. R01s up to 4 yrs; R21s up to 3 yrs
  - SBIR/STTR funds will be in addition to those listed in the previous bullets

Activity	FY16	FY17	FY18	FY19	FY20	FY21	FY22
Novel Nucleic Acid Sequencing Technologies	$2M	$4M	$6M	$8M	$6M	$4M	$2M

1- Novel Nucleic Acid Sequencing Technology Development

Examples of potential research topics include:

- Novel chemistries, physics or instrumentation for entirely new ways to perform DNA sequencing. Examples of important sequencing needs include:
  - Exhaustive and quantitative sequencing of every DNA and/or RNA molecule in a sample
  - Very long reads (e.g., ≥150 Kb) with accuracy and error structure sufficient to *de novo* assemble human genomes
- Direct RNA sequencing of full length transcripts without a cDNA intermediate
- Several orders of magnitude improvements to existing sequencing technologies
- All of the above w/o sacrificing cost

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Timeline For Initiatives

Event	Date
Concept Clearance Council Review:	May 2015
FOAs Released:	Summer 2015
Scientific Review:	Winter 2016
Council Review:	May 2016
Funding:	Summer 2016

2- Genomic Technology Development Awards

- Purpose: Catalyze investigator-initiated genomic technology development that impacts the field within five to seven years.
- Scope and Objectives: Enable a wide swath of genomic technology development for, e.g.:
  - High throughput/high information content functional analysis with genomic readout
  - Single cell methods for everything on the list
  - Foundational technologies (e.g., sample prep, novel sensors)
  - Transcriptome analysis
  - Functional analysis
- Mechanisms of Support and Budget
  - $3M TC in additional RPG funding/year; four years (FY16-19); PARs
  - 3-6 awards each year. R01s up to 4 yrs; R21s up to 3 yrs
  - SBIR/STTR funds will be in addition to those listed in the previous bullets

Activity	FY16	FY17	FY18	FY19	FY20	FY21	FY22
Genomic Technology Development Awards	$3M	$6M	$9M	$12M	$9M	$6M	$3M

2- Genomic Technology Development Awards

Examples of potential research topics include:

- DNA, RNA, epigenome, protein, etc. from the same sample
- High throughput genome modifications (by recombination and transient assays), for replacement, activation and inhibition, with genomic readout
- Scaling DNA sequencing, transcriptome, and functional technologies to operate on 10^4 samples (with ultimate goal of 10^8 cost-effectively) for, e.g., single cell/small samples and for population studies
- *In situ* methods (tissue context) for DNA, epigenome, RNA, and protein
- Measuring proximal transcription dynamics, and transcriptome dynamics over time, from cells to organs
- Generating sequence tags at orders of magnitude lower costs than currently available

Budget Summary*

Activity**	FY16	FY17	FY18	FY19	FY20	FY21	FY22
Novel Nucleic Acid Sequencing Technologies	$2M	$4M	$6M	$8M	$6M	$4M	$2M
Genomic Technology Development Awards	$3M	$6M	$9M	$12M	$9M	$6M	$3M
Total	$5M	$10M	$15M	$20M	$15M	$10M	$5M

* The current concept funds at the previous $1000 genome level, but is split between sequencing RFAs ($2M new grants per year) and the wider genomic PARs ($3M new grants per year) for technology development.

** R01s of up to four years and R21s of up to three years are anticipated.

Note: SBIR/STTR funds will be in addition to the amounts listed above.

Genomic Tech Dev Budget

$1,000 Genome RPG spending.

FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14
$22.8M	$22.2M	$15.8M	$20.8M	$18.1M	$15.7M	$15.1M	$14.2M	$13.8M

FY15	FY16	FY17
$9.9M	$5.5M	$1.2M

Proposed Genomic Technology Development Concept

Activity**	FY16	FY17	FY18	FY19	FY20	FY21	FY22
Novel Nucleic Acid Sequencing Technologies	$2M	$4M	$6M	$8M	$6M	$4M	$2M
Genomic Technology Development Awards	$3M	$6M	$9M	$12M	$9M	$6M	$3M
Total	$5M	$10M	$15M	$20M	$15M	$10M	$5M

Thank you's to:

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Mike Pazin
Adam Felsenfeld
Bettie Graham

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Jay Shendure
& 21 other workshop/survey participants