Cyber-enabled Discovery and Innovation (CDI)

Enhance American competitiveness by enabling innovation through the use of computational thinking

Long-term Funding for Cyber-enabled Discovery and Innovation

- All NSF directorates are participating in this activity (*subject to budget approval*); estimated $750M investment in 5 years:

Request FY 2008	FY 2009	FY 2010	FY2011	FY 2012
$ 48 M (min of $26M in the solicitation)	$100M	$150M	$200M	$250M

Cyber-Enabled Discovery and Innovation

- Multi-disciplinary research seeking contributions to more than one area of science or engineering, by innovation in, or innovative use of computational thinking

- Computational thinking refers to computational…
  - …Concepts
  - …Methods
  - …Models
  - …Algorithms
  - …Tools

CDI is Unique within NSF

- five-year initiative
- all directorates, programmatic offices involved
- to create *revolutionary* science and engineering research outcomes
- made possible by innovations and advances in computational thinking
- emphasis on bold, multidisciplinary activities
- radical, paradigm-changing science and engineering outcomes through computational thinking

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CDI Philosophy

- "Business as usual" need not apply
  - ***"Projects that make straightforward use of existing computational concepts, methods, models, algorithms and tools to significantly advance only one discipline should be submitted to an appropriate program in that field instead of to CDI."***
- No place for incremental research
- Untraditional approaches and collaborations welcome

Three CDI Themes

CDI seeks transformative research in the following general themes, via innovations in, and/or innovative use of, computational thinking:

- **From Data to Knowledge:** *enhancing human cognition and generating new knowledge from a wealth of heterogeneous digital data;*
- **Understanding Complexity in Natural, Built, and Social Systems:** *deriving fundamental insights on systems comprising multiple interacting elements;* and
- **Building Virtual Organizations:** *enhancing discovery and innovation by bringing people and resources together across institutional, geographical and cultural boundaries*.

Broadening Participation and International Collaborations

- diversity of sciences and engineering, academic departments
- underrepresented minorities in STEM

- Intellectual collaborations with industry
- International Collaborations

NSF Review Criteria

- Intellectual Merit
- Broader Impacts
- New on Transformative Research: to what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts?

Additional CDI Review Criteria

- The proposal should define a bold multidisciplinary research agenda that, through computational thinking, promises paradigm-shifting outcomes in more than one field of science and engineering.
- The proposal should provide a clear and compelling rationale that describes how innovations in, and/or innovative use of, computational thinking will lead to the desired project outcomes.
- The proposal should draw on productive intellectual partnerships that capitalize upon knowledge and expertise synergies in multiple fields or sub-fields in science or engineering and/or in multiple types of organizations.
- potential for extraordinary outcomes, such as,
  - revolutionizing entire disciplines,
  - creating entirely new fields, or
  - disrupting accepted theories and perspectives

    … as a result of taking a fresh, multi-disciplinary approach.

Special emphasis will be placed on proposals that promise to enhance competitiveness, innovation, or safety and security in the United States.

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Types of Projects

- CDI defines research modalities
- Project size **not** measured by $$
- Projects classified by magnitude of **effort**
- Three types are defined: **Types I** (~2 PI, 2 GRA), **Type II** (~3 PI, 3 GRA, 1 post-doc), and **Type III** (center scale).
- Type III, center-scale efforts, is not supported in the first year of CDI (2008)

Key Dates:

- Letters of Intent (required) due [FY 08 (FY09)]:
  Nov 30, 07 (Sep 30, 2008)
- Preliminary Proposals due:
  Jan 8, 08 (Nov 04, 2008)
- Full proposals due:
  April 29, 08 (Feb 27, 2009)
  - Full proposals by invitation only!
- Awards: no later than October 2008 (Summer 2009)
- For more information:
  - Solicitation: http://www.nsf.gov/pubs/2007/nsf07603/nsf07603.htm
  - FAQ, examples, resources: http://www.nsf.gov/crssprgm/cdi .

Watch for Revised Solicitation

More Information on CDI:

- Contact members of CDIWG.
  - Contact the CDI Co-chairs Sirin Tekinay (CISE), Tom Russell (MPS), Eduardo Misawa(ENG) or members of the team listed in the solicitation
- cdi@nsf.gov ; (703) 292-8080
- http://www.nsf.gov/crssprgm/cdi/

In Summary…

- CDI Philosophy: multidisciplinary transformative research enabled by computational thinking
- CDI Review Criteria
- FY 2008 CDI Competition: min $26M
- 3 CDI Themes
- CDI Project Types: type I and II
- Broad Participations: most welcome
- Deadlines and contact information

Questions? Comments?