i-Science2Jobs: INFORMATION FUELS DISCOVERY AND INNOVATION

> *"The rules have changed. In a single generation, revolutions in technology have transformed the way we live, work and do business . . . . In America, innovation doesn't just change our lives. It is how we make our living. . . ."*
>
> ***"This is our generation's Sputnik moment."***
>
> *-- President Obama, State of the Union, 2011*

The Vision

Imagine . . .

- ✓ **a scientist has full and simultaneous access to research data, information, tools, and colleagues;**
- ✓ **an entrepreneur or innovator quickly and easily locates historical findings and recent applications in various disciplines;**
- ✓ **a researcher or educator instantly connects with peers who are exploring similar problems;**
- ✓ **breakthroughs occur with the immediate application of newly acquired knowledge;**
- ✓ **discoveries are made and shared daily; and**
- ✓ **scientific advances yield economic prosperity and well-being.**

The **i-Science2Jobs interagency initiative** will thoroughly transform the Federal science and technology knowledge infrastructure so that it directly and seamlessly fuels data-intensive science, propels STEM education, and sparks workplace innovation. In turn, these will stimulate economic health, create jobs, and strengthen U.S. competitiveness in the global marketplace. Simply put, the next-generation knowledge platform will provide data, tools, and services that will stimulate scientific and economic progress.

The Benefits To You

1. Simple and fast access to vast amounts of federal scientific data and information in their various forms (text, numeric data, images, audio, video), regardless of when they were produced or which agency produced them.

2. Scientific data anytime and anywhere on any mobile device.

3. Clear, precise computer-generated answers to questions based on accurately understanding of what you need.

4. Valuable opportunities discovered by interlinking assets, ideas, individuals, and innovations.

This i-Science2Jobs initiative will (1) transform Science.gov to serve as the next-generation science and technology knowledge infrastructure to meet 21st century science, technology, and business needs; and (2) coalesce interagency capabilities to tackle technological challenges and reduce procedural barriers.

Next Generation Science.gov

Access to new information and facts, especially research results, has increased dramatically in the last decade, thanks in part to Science.gov. This interagency science portal provides single-query access to 45 databases and over 2,000 websites from 14 Federal agencies that together represent 97% of the Federal R&D budget. It is an unparalleled collaboration, but it can be even better. The i-Science2Jobs initiative will take Science.gov to a new level, providing greater access to science and scientific discovery while capitalizing on the basic truth that science is more than just facts.

Underlying this transformation of Science.gov is *i-Science--I*nternet-based science derived from radical new access to *i*nformation, *i*deas, *i*nnovations and *i*ndividuals. *I*deas in the form of new questions, hypotheses and speculations—the engine of scientific progress—need to circulate faster than ever before. The value of a scientific result lies not only in the knowledge it adds, but also in the ideas it leads to when it is shared. Access to innovation spreads creative and new technologies, methods, approaches, and procedures to fields and industries needing a spark. And the individuals wrestling with pressing scientific problems need to find each other, tapping into the synergy and support only social networking can provide.

Putting these building blocks in place, i-Science will take giant steps in accelerating scientific progress. But we don't just speed up science when we provide more effective access to information, innovations, ideas and individuals; rather we actually change the way science is done.

Moving Forward

To transform Science.gov, some major technical challenges must be met, including:

- Linking knowledge shared in text formats to presentations of non-text data.
- Integrating emerging semantic search technologies with the Science.gov federated search.
- Incorporating innovative analytical, data mining, networking and visualization capabilities into the Science.gov platform.
- Developing automated systems for answering complex questions to help those seeking understanding and not just facts.

Without i-Science, no scientist could possibly find useful information in more than a tiny fraction of this great mass of web-accessible thought. But i-Science is already beginning to make it all findable and changing the network structure of how science is done in the process. For example, international collaboration is poised to increase dramatically because international portals like WorldWideScience.org, which encompasses Science.gov, make it possible for individual scientists to find one another around the globe, even when writing in different languages. One of the most needed innovations is a semantic search capability that promises to find related articles in far-flung sources.

i-Science2Jobs strives to realize the potential for scientific and economic progress, with each of the Federal R&D agencies pursuing that part of the i-Science challenge to which it is best suited. Agencies will contribute their best technological innovations, their new digital data, more comprehensive content, better connections, and more powerful tools. Some agencies will focus on multi-media and mobile applications, while others will focus on semantic search or data policies and management plans to foster appropriate access to such data. All will be coordinated through the proven interagency open government model of Science.gov.

Accelerating Innovation, Generating Jobs

The timing could not be better: a data deluge is affecting virtually all aspects of science—experimental, theoretical, and computational. By capitalizing on Science.gov and recent advances in computing and social technologies, the nation can shift rapidly to an innovative atmosphere that builds on our scientific leadership to create and sustain a vibrant and productive economy. By sharing knowledge more quickly and easily, we can accelerate innovation, spark job growth, and strengthen our global competitiveness.

Life at the scientific frontier is changing. With i-Science2Jobs, it will change even more in the years to come to further accelerate science.

And where do jobs come into the picture? Johns Hopkins immediate past-president William R. Brody* explains it this way: ***"Knowledge drives innovation; innovation drives productivity; productivity drives our economic growth. That's all there is to it."***

About the Proposers

CENDI, a consortium of Federal Scientific and Technical Information Managers, works collaboratively to share best practices and face challenges together so that the sum of accomplishments is greater than each individual agency can achieve on its own. CENDI members developed the gateway to Federal science information and research results—Science.gov. The Science.gov framework, supported by 18 scientific and technical organizations from 14 federal agencies, provides the perfect springboard for developing a fully integrated national science and technology knowledge infrastructure.

CENDI members are poised to lead this initiative by deploying swiftly emerging technical building blocks. We have the cooperation of U.S. industry and the information giants; innovative capabilities of small and medium-sized enterprises; and ongoing connections with academia.

With these pieces in place, CENDI can bring about a revolutionary transformation of Science.gov by creating new data, content, connections, and tools and delivering technological innovations such as semantic search, mobile computing, data visualization, language translation, and audio and video indexing. Such changes will bring velocity to the progress of new ideas, new products, new industries and new employment. Interagency cooperation through CENDI will harness the best ideas from the agencies and integrate the innovations into a transformed Science.gov. i-Science2Jobs will increase the return on our Nation's $150B annual Federal R&D investment by accelerating the use of a key national asset, the scientific data and information resulting from our R&D programs.

CENDI has a demonstrated performance record in achieving great things.

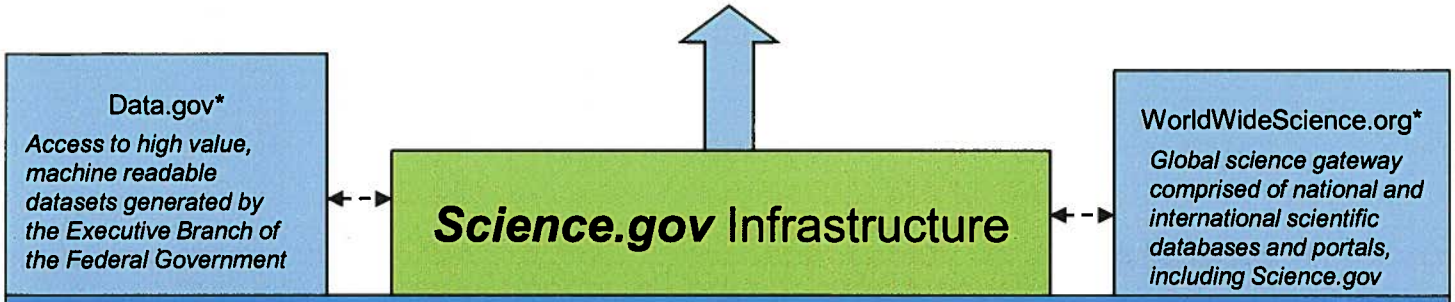
We are prepared to meet the challenge of this new Sputnik moment with **i-Science2Jobs.**

* William R. Brody, *U S. Competitiveness: The Innovation Challenge,* Testimony to the House Committee on Science, July 21, 2005.

i-Science2Jobs: Information Fuels Discovery and Innovation

The i-*Science2Jobs* initiative will transform Science.gov to next-generation platform and provide data, tools, and services for scientific and economic progress

- Make more content searchable (to include charts, graphs, tables, etc.)
- Incorporate information sources not currently available/accessible (in machine-readable formats)
- Incorporate databases from all scientific communities (without burden to the producer and without boundary limitations of scientific disciplines)
- Move beyond text – numeric data, images, audio, video, etc.
- Enhance precision search capabilities
- Leverage collaboration tools (social media, peer-to-peer networks)
- Integrate use of analytical tools
- Deliver data and information via mobile devices
- Offer translation capability
- Develop scientific research data management plans
- Address digital data and scholarly information access and preservation policies
- Improving sophistication and speed of relevancy ranking
- Developing next-generation algorithms for data-enabled science
- Discovering and implementing visualization techniques and geospatial mapping
- Amplifying computing power; storage capacity
- Deploying emerging technologies to enable extraction of ever increasing content
- Employing semantic search technologies (and any required unified vocabularies)
- Providing data mining applications to help solve scientific queries and problems
- Pursue research programs on science knowledge diffusion
- Offering pathways based on audience, e.g., entrepreneurs, small business, researchers, educators and students



Science.gov…A Gateway to government science information and research results
Governed by volunteer Science.gov Alliance and supported
by CENDI interagency partners, is recommended platform for the i-***Science2Jobs*** initiative

*Data.gov and WorldWideScience.org are complementary to Science.gov and i-***Science2Jobs*** initiative.